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VIEWS, NEWS AND INTERVIEWS

Some years ago, when the Third Avenue Railroad, in New York city, laid its cable conduit a considerable quantity of cement concrete was used on the underground structure—then regarded as a permanent and time-defying work. Now it is being transformed into an electric conduit railway, and the needs of the work require much of the old concrete to be removed. It is being painfully chipped out with cold-chisels, for it is the hardest concrete ever seen in New York. The singular part of the matter is that no more cement of the kind originally used can be found, the contractor who supplied it having gone out of business after, for once, furnishing material that was too good.

A true story is told of a man who had a good stream of water running through his farm, and, having heard of the wonders of a turbine water-wheel, concluded to build him a mill, says the *American Machinist*. Having a nice level place by the creek, he built the mill. Finding out how much power he wanted and consulting the catalogue, he found that a certain size wheel at 22 feet head would do the business, and, getting the guarantee that the wheel would work just as well under water as above, he proceeded to dig a well 22 feet deep, and put his wheel at the bottom of the well. It wasn't long after that he had a mill for sale and a water-wheel to scrap.

The Franklin fund, which now amounts to about $400,000, and which represents with interest the result of a bequest of 1,000 pounds sterling which was left to the city of Boston by Benjamin Franklin in 1791, is to be expended. The full vote of the aldermen is needed as yet, but a plan has been broached and accepted by the sub-committee to use one-half of the sum for the erection of a public building which shall have a hall to be used for a public forum. The other half of the fund is to be spent for the extension of Mayor Quincy's bath and gymnasium schemes. The public building is to be known as the "Franklin Building," and it will be built in the South End. It is planned to have various lecture rooms in it and to carry on courses of lectures on trade subjects.

Electric light poles should not be put to illegitimate uses as the following truthful tale will show:

A 13-year-old boy named James Flannery, living in Brooklyn, N. Y., an enthusiastic "rooter" for the local baseball team, climbed an electric light pole the other day so that he might see the game free of charge. He got too near the wires and received a shock which caused him to loosen his hold, drop to the ground, 20 feet below, and sustain a compound fracture of both arms and several severe bruises.

Mr. Hayden Carruth says: "It is to be hoped, by the way, that however sweeping the invasion of automobiles may become, that a few horses may, at least, be retained for literary purposes; it will be exceedingly difficult to lend verisimilitude to the scene of an electric brougham standing over its disabled master, neighing loudly for assistance, or of a gasoline road wagon snorting off to the nearest justice of the peace because its driver is in controversy with a footpad."

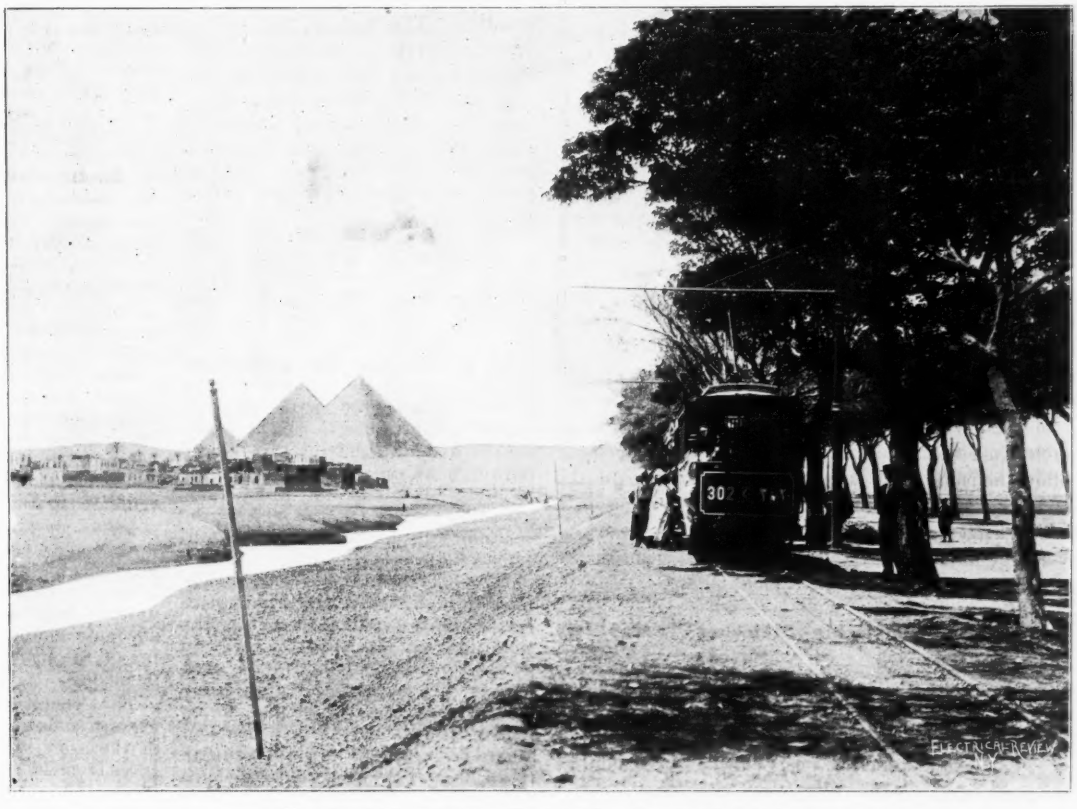

FIG. 1.—A VIEW ON THE TROLLEY LINE TO THE PYRAMIDS.

The Trolley Line to the Pyramids.

Every traveler from Europe to India knows Shepheards' Hotel in Cairo. It is the half-way house for all travel from European civilization to the far more ancient civilization of the East, which is now in its decadence. Shepheards' Hotel stands as an oasis in the desert. Furnished with the latest devices for luxury and comfort the interior of the hotel leads the traveler to suppose himself in London, Paris or New York, but upon emerging into the street the scene is changed. At once he finds himself surrounded by oriental scenes, quaint buildings, garments of the fashions of centuries ago, women with veiled faces, and all that is characteristic of eastern surroundings.

Among these strange environments the native of Pittsburgh will find one remembrance of his far-away native city. Part of Cairo has been invaded with electric tramways, the cars carrying motors manufactured by the Westinghouse Electric and Manufacturing Company. The Société Anonyme des Tramways du Caire commenced operations in the year 1896, having laid about 18 miles of track. Four separate branches diverge from the center of the city, one going to Abbassiyeh, the English cavalry barracks; one to Bulak, or old Cairo, and to the Citadel, the latter familiar to the reader because of the massacre of the Mamelukes.

The financial success of these lines encouraged the company to commence operation upon an extension. Every visitor to Egypt arrives there with one

thought, to visit the Pyramids and the Sphinx. These are the centers of attraction, as much so as Niagara Falls is to the European tourist in the United States. The new tramway line runs from the west end of Kasr-el-Nil bridge, one mile from the center of Cairo, extending up the bank of the Nile a distance of two miles, to Gizeh, and thence in a westerly direction for seven and one-half miles to the foot of the Gizeh Pyramids and the Sphinx.

The native Egyptian looks upon his venerable monuments of antiquity with great reverence and awe, and can not understand the hilarious manners of the European visitors, who make the occasion of the visit one of eating and drinking and singing irreverent songs. Perhaps much of the irreverence of the tourist may be ascribed to the usual method of approach to the Pyramids, which is painfully disappointing. The new tramway line affords views from several points and will serve to increase the strange fascination which grows gradually when the Pyramids have been seen several times.

At present the tramway is not allowed to cross the Kasr-el-Nil bridge to connect with the city lines. The members of the Egyptian Railway Commission have raised several objections, alleging that the bridge is not sufficiently strong to carry the cars. For a considerable time the commission would not allow the company to cross railway tracks, but this has since been waived. The desecration of the Pyramids by a large number of the tourists may have had weight with the minds of the commissioners.

The line to the Pyramids is single track, with turnouts for cars to pass each other, but it is soon to be made a double-track road throughout, as the traffic is increasing. The usual overhead trolley wires are used. The cars are of the enclosed type, seating 28 persons each. An interior division affords apartments for both first and second class passengers. The visitor from Pittsburgh will feel that a spring in his inner consciousness has been touched upon learning that the electric motors propelling the cars are manufactured in Pittsburgh. Two steel motors, wound for 500 volts, are mounted upon each of the cars, each motor giving an output of 20 horsepower. When testing the speed of the cars it was found that one hauling two trailers filled with Arabs, a gross weight of 20 tons, obtained a speed of 45 kilometres (30 miles) per hour. The motormen are all native Arabs, as are the conductors also. Their uniform is of tight-fitting yellow-duck cloth, with a black belt.

At present the fare is maintained at what we should consider rather a high rate. For each journey one pays five piastres, and the same back, equal to about 50 cents, American money. The trip from the bridge to the Pyramids can be made in 14 minutes, but it is usual to occupy one hour for the round trip. The route taken by the cars is very attractive; trees line the road on both sides for about eight miles. The tracks for the cars are on the left edge under the branches. The great value of this ride consists in the long-distance views of the Pyramids. The first thing visible to the passenger is a great cone sharply outlined against the densely blue sky. Immediately in the rear of this great cone two others loom heavily up. This aspect of the three giants is of startling impressiveness. The trolley cars rapidly pass the village of the Bedouins, to whom is entrusted the care of the Sphinx and Pyramids. The village, seen from the car tracks, resembles a series of ruins standing upon the sands of the desert. These Bedouins enjoy a monopoly of conducting visitors to the Pyramids. They are very expert in rendering assistance to those ambitious enough to desire to reach the top.

Experience has shown that, as facilities are granted, traffic increases. The small line of tramway to the Pyramids and the Sphinx seems a trifle, yet it will afford the means for many thousands to visit comfortably these ancient monuments.

Cableship "Hooker" May Be Saved.

The War Department has learned that the United States cableship "Hooker," which recently ran aground on Corregidor Island, in Manila Bay, and was considered a total loss, may be saved. She had material for a submarine cable on board, and it was intended to use her in connecting all the important islands of the Philippine group by telegraph. General Otis reports that arrangements have been made for getting the "Hooker" off the rocks and taking her to Cavité arsenal, where she will receive repairs sufficient to permit her to go to Hong Kong to be thoroughly overhauled and put in first-class condition.

Lewiston, Me., to Boston by Trolley.

Plans are said to be now under way by which travel by electric railway will be possible from Lewiston, Me., to Boston by next July.

THE PRESENT STATUS OF THE STREET RAILWAY.*

BY G. TRACY ROGERS.

Expansion seems to be the order of the day and is not confined to the government. The street railways of this country have been the means of expanding our cities and reaching out into the adjacent villages and hamlets, and the building of interurban roads has been more marked than ever, and I believe the work will be of untold benefit.

The development of interurban roads is one of the most interesting and promising studies of the day, both sociologically and physically; by it the farm life is relieved of many of the disadvantages which belong to isolation. The new electric railway construction is on a healthy basis. Practical street railway men who are now interested in street railway properties are quietly looking about and planning interurban lines, which if they build, judging from past experiences, will soon become paying properties.

The interurban railroad proposition is an attractive one, especially to street railway owners and managers who have had experience with city property. The question of franchise is much simpler than in the cities, in spite of the fact that concessions usually have to be secured from a greater number of municipalities. The abutting owner is benefited to a greater extent by having the railway in front of his property than is the case in cities. It gives him direct transportation at his door, and, in fact, the community as a whole is ready to welcome a transportation agency which is more convenient and cheaper than heretofore existed. In the next place franchises are usually perpetual and the conditions are less apt to be reviewed by a Common Council with each change of administration. In many cases mechanical problems, which render the life of the city manager a burden, disappear in the interurban railroads. The track can be built and rails or ties replaced without pavement excavation. There seems to be less chance for radical changes in the development of the interurban roads than in the present city service.

The success which has attended the alternating current has largely contributed to the rapid development of the interurban service, and the cheap accommodation, as compared to steam railroads, has very materially stimulated the building of these roads. In many instances, steam railroads which were losing ventures have been electrified and made to pay handsome returns upon the investment. By experience it has been shown that a trolley line can be constructed, maintained and operated at a less cost than a steam line. The steam railroads recognize this dangerous competitor for short-distance travel, and in some instances are doing their utmost to suppress it, but "it is a condition and not a theory that confronts them."

The carrying of freight by electric railroads is one of the most important matters which affect interurban roads, and some of them to a serious extent. In some instances the steam railroads have questioned the right of the trolley roads to carry freight, but in a recent decision in the Supreme Court of New York, rendered by Judge Marean, it was clearly decided that the trolley roads of this state had a right to transport freight and express matter. I think that the steam railroads stand in their own light in attempting to fight this proposition, as transportation begets freight and creates business. While in a few cases the interurban road will interfere to a small extent with existing business between two points, at other places it would give more than it takes. There is no good reason why the trolley road, occupying streets and highways, should not haul freight and express over its tracks as well as any company organized to do a general teaming business, which hauls the same identical merchandise over the same roads in wagons, and which uses the streets and pavements of cities or country roads. The movement of cars drawn by steam locomotives over streets is an entirely different proposition.

The question of carrying the United States mail on electric cars has been discussed both pro and con. I am satisfied that the carrying of the United States mail at the present rates is not a profitable department of the trolley road, but there is no question but that it is a great accommodation to our patrons and a convenience to the public. This compensates, in a large measure, for the meagre payment we receive for this service, however, I believe "the laborer is worthy of his hire" and a united effort on our part to secure adequate compensation for the carrying of the United States mail should be made.

The operating expenses of the average street railway is 60 per cent of the gross receipts. Labor constitutes from 40 per cent to 60 per cent of the total operating expenses; *i. e.*, from 25 per cent to 35 per cent of the gross earnings goes to pay labor; therefore when earnings are reduced five per cent through hostilities, legislation, or otherwise, the natural result is that the employés will suffer a reduction in wages from 15 to 20 per cent.

The street railroads have pursued a liberal and progressive policy; they not only keep abreast of the times, but have, of their own accord, made good and valuable concessions, and this without moral or legal obligations. The public, as a rule, seem to accept these concessions with a "thank you" at the time, but it is not long before they expect still further concessions and forget the past. Extensions are being made in every large city, gradually increasing the haul but without increasing the fare,

*Extracts from the presidential address before the Street Railway Association of the State of New York, Ithaca, N. Y., September 12, 1899.

and now in large cities five cents carries the rider to almost any part of the city, and four or five times as far as it did 10 years ago. Without question, a liberal policy pays everywhere, and the broad gauged progressive ideas adopted by the street railroads can not fail to be appreciated by a fair-minded public.

Progressive citizens make successful cities. Villages grow into cities by the efforts of men more than by the force of circumstances. The progressive street railway man of this country has, in many instances, been obliged to fight bitterly in order to carry out the advanced ideas or plans which he may have conceived for rapid transit. Often these plans were far in advance of the times and the public failed to grasp the benefits to be derived from them, and has not only made it difficult to carry them into execution, but in many instances defeated enterprises which would have added very largely to the public comfort and the advancement of taxable property. The public should take into consideration the fact that a street railroad (differing from almost every other business) must be operated 365 days in the year, and from 18 to 24 hours a day, and the manager must meet the complaints, desires and whims of the public with a pleasant smile, and must be like the compass with the four cardinal points. He must understand the people's wants, the employés wants, the city's wants and the stockholders' wants, all four having claims which must and should be satisfied. In many cases these interests are conflicting. The people seem to regard the operation of a street railway as a decidedly easy matter. While it may appear so to them—and they no doubt intend to be fair—there are difficulties which have been worked out by systematic methods which mislead them in their judgment. No line of business tends more rapidly to build up suburban territory, furnishes cheap, comfortable and healthful homes to people within reach of their business, develops the growth of the city, brings unimproved and dormant real estate into the market and increases the assessed value of city property. The street railroads have done much toward the social and moral advancement of the communities in which they are located.

Much has been said against trusts and consolidation of business interests. We are one of the exceptions. I can state, without fear of contradiction, that in every instance of consolidation of street railroads the public has been benefited, and the conveniences of civilized life have been enhanced.

We have been accustomed to hear the familiar expression "Everything has been cheapened in price, but street-car fare remains the same." It is now an undisputed fact that nearly everything has advanced in price, especially material used by street railways, but "street-car fare remains the same," and in this connection I will state that twice as much accommodation and benefit is being given for a five-cent fare as at the beginning of the present decade, and hence street-car fares have actually been cheapened by more than 50 per cent. What constitutes a ride in a street car to-day is certainly double the ride of 10 years ago, and the cost of operating is twice as much as under the old method and system. The more than generous distribution of transfers has, I believe, had the effect to quiet the three or four-cent advocate. The average total cost of carrying a passenger is three and eight-tenths for each person, and if one will carefully study the street railway system of New York city he can live aboard the cars for an indefinite period, for a nickel.

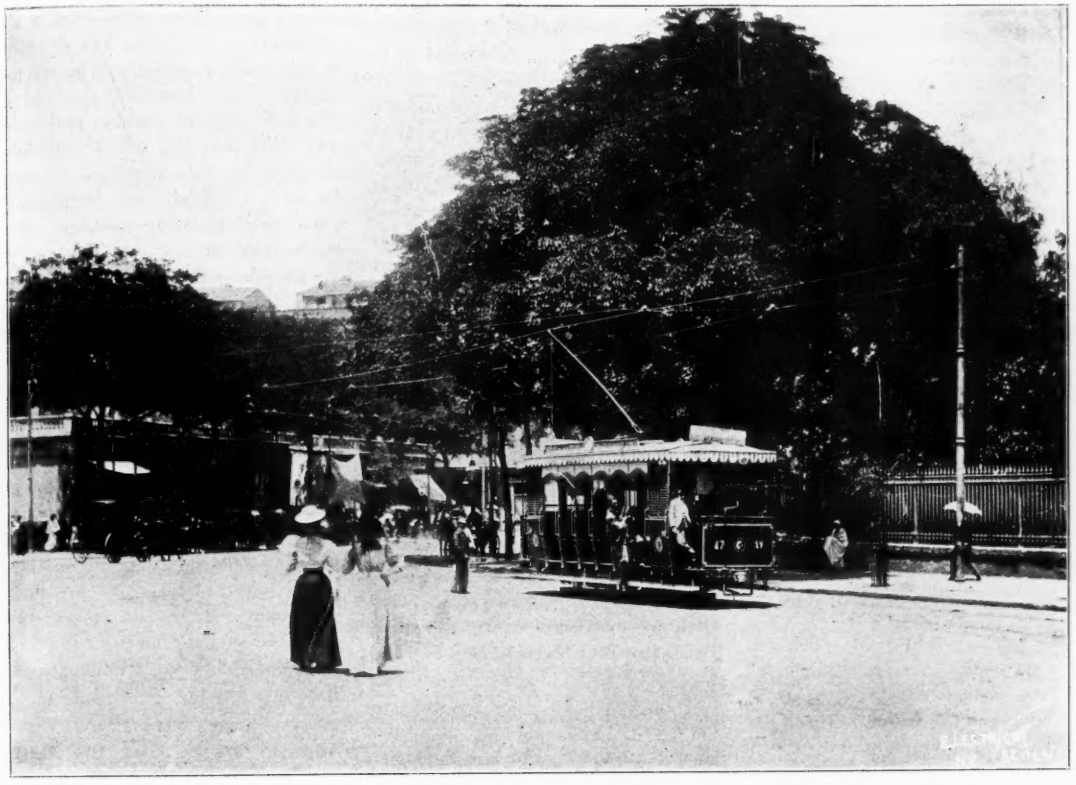

FIG. 2.—A VIEW OF THE TROLLEY LINE IN CAIRO, EGYPT. (See page 177.)

It has been stated, on good authority, that the high-water mark of bicycles was reached in 1897. In my opinion, the bicycle will be continued as a convenience, but its use as a pastime is on the wane.

The automobile has taken a position of the utmost importance in the transportation of the world. What effect it will have upon street railway travel we are unable to state. It will, no doubt, in a large degree, take the place of the horse, but I question it ever supplementing the street car. As yet, it is largely experimental; however, the possibilities of the automobile's practicability in the line of cabs, omnibuses, etc., must be regarded by street railway men with close attention, if not concern.

Much has been said and written regarding the maintenance of parks by street railways; also the question of furnishing free entertainments for the public at these pleasure resorts. There is no question but that this department of our business can be overdone and made unprofitable, and each road should be governed by circumstances and the surroundings. For instance, in New York city the question is "How can we carry the people who desire to ride?" and in smaller cities "How can we induce the people to ride?" Again, great judgment should be displayed in the location of the park or pleasure ground, as relative to the city and the ability to transport the crowd rapidly. The amount expended in this direction should at least show an equal amount in the returns. There are also other advantages which are evidently overlooked. In the first place, it is a natural tendency for the number of pleasure-seekers to increase, and the advantages of a park in the neighborhood of a city are considerable, and will appeal to the continually changing number of persons. The real value of property of this kind is increased somewhat by its accessibility, but depends largely upon the manner in which the park is conducted. The success or failure, in some instances, is almost entirely dependent upon the proper selection of attractions. The park is looked to for amusement, and, unless amusement of some kind is furnished the public, the road depending upon it for increased travel will, in my opinion, be very much disappointed. The question of charging admission to parks has been thoroughly discussed heretofore at various conventions. In most instances where the sale of liquor has been conducted, I am informed the parks were failures. Municipal ownership has received some very severe blows of late. In nearly every instance where fair propositions have been discussed as to the method or means by which municipalities could become the owners of street railroads, we have seen the municipalities dodge the issue; but if municipal ownership could be obtained by confiscation no doubt that theory would have plenty of adherents. I believe it has been very thoroughly demonstrated that it would be utterly unwise to place the control of a city's transportation agency in any other than private hands. The interest of a growing city and its street railroads should be mutual, and no pains should be spared on the part of the street railway to meet every fair, legitimate demand made by the city's officials, the public and the press, and all should work together to build up and develope, on broad lines, the municipality.

There are two sides to the question of short-time franchises. In one instance, the obtaining of capital to finance the property on a short-term franchise is not only difficult and dangerous to the investor, but large rates are demanded, and the same degree of permanency can not be used in construction and equipment, as illustrated by the New York city railway companies, which have expended millions of dollars in the adoption of cable and electricity, and are giving New York the universal transfer system and improved cars and car service, which they could not have done under short-term franchises.

SCIENCE BREVITIES.

Spectra of Oscillating Sparks—In a note contributed to the Académie des Sciences, M. G. A. Hemsalech states that when the spectrum of a spark, made in a circuit in which the self-induction is variable, is observed, it is found that, for a certain value of the self-induction, the spectrum becomes almost free of lines due to the atmosphere, and thus presents in the clearest way the true characteristics of the metals constituting the electrodes. It is thus possible, by varying the self-induction, to adjust the spark for accurate conditions, a fact that will doubtless be of importance in physical observations of this character.

Steel at Liquid Air Temperature—M. F. Osmond recently contributed to the Académie des Sciences the results of some experiments made on steel at the very low temperature produced by the evaporation of liquid air. In 1890 the late Dr. Hopkinson discovered that steel, containing 25 per cent of nickel, which was non-magnetic at ordinary temperatures, became magnetic at the temperature of solid carbonic acid. M. Osmond found out that this property is also inherent in other alloys of nickel when carried to the lower temperature of liquid air, and concludes that the hypothesis of Hopkinson, which assumed the existence of a definite alloy, $Fe_3 Ni$, is not correct.

A Use for Liquid Hydrogen—The use of liquid hydrogen has been proposed by Professor Dewar for the production of very high vacua.* If the end of a closed tube containing air is immersed in liquid hydrogen, the contents of the tube are quickly condensed to solid air, and if the portion of the tube from which the air has thus been removed is sealed with a blow-pipe, a vacuum is obtained so high that it will scarcely allow an electric discharge to pass. This condensation is accomplished almost instantly, the required time of immersion never being more than a minute. This gives a simple means of obtaining the high vacuum necessary in Crookes tubes, and might possibly be on a large scale sufficiently economical for use in incandescent lamp works.

Theories of Atmospheric Electricity—From the days of Benjamin Franklin to the present, says M. Chauveau in a paper read before the French Physical Society, no less than 30 hypotheses have been brought forward to explain the phenomena of atmospheric electricity, but not one of them to-day suffices to explain all of the known facts. The recent hypothesis of Peltier, concerning the partial dissipation of the negative electric charge of the earth by the evaporation of water, is sufficient to give a reasonable explanation of the electric condition of the inferior strata of air. The predominance of cloud masses at medium altitudes of from 3,000 to 13,000 feet does not appear to be reconciliable with any hypothesis, but may perhaps be brought under the suggestion of Lenard concerning the electrification produced in the atmosphere above oceans by the effect of wave motion. Edlund's theory, founded upon the phenomena of unipolar induction discovered by Weber, fairly well explains the production of the polar aurora, but itself is founded upon a hypothesis not tenable in the present state of science.

Electrolytic Ozone—Prof. E. Andreoli, who has done so much work on the manufacture and production of ozone by electro-static methods, has contributed a long and interesting article to one of our French contemporaries upon the production of this gas by the electrolysis of water, giving the history of research on this subject. It appears that so long ago as 1850 it was found out that under certain conditions the oxygen resulting from the decomposition of acidulated water contained a small proportion of ozone. In 1854, Soret, working along the same lines, noted the fact that the temperature of the electrolyte had much to do with the percentage of ozone formed. It became, after this, the general consensus of experimenters that the acid solution should be highly concentrated and the currents used intense with reference to the size of the electrodes employed. Some time prior to 1860 a French patent was issued for a process in which the electrolyte was a saturated solution of permanganate of potash, containing from 5 to 10 per cent of sulphuric acid. It was claimed for this that no less than 38½ per cent of the gas given off at the anode was ozone, but it was not stated what was the efficiency of the process with reference to the energy expended or the speed of generation absolutely considered. It was also shown about this time that an electrolyte composed of water, nitric acid and hydrofluoric acid gave much ozone. The conclusion of Professor Andreoli's discussion of the history of this interesting subject is that it is now time to rescue the electrolytic production of ozone from the oblivion into which it has fallen, in view of the great value of this gas as an agent in many industrial operations.

X-Rays in Medicine—The benefit which surgery has derived from the improvements which have been effected in the use of the Roentgen rays during the past year is, Dr. Moullin states in a recent paper before the Roentgen Society, no less striking than that gained by medicine. As might be expected, the largest proportion and the most striking cases have been furnished by the injuries and diseases of bones and joints. With a well lit fluorescent screen the nature of an injury can be seen at once, and, what is even more valuable, it is no less easy to ascertain whether a fracture is properly set or a dislocation completely reduced. If the screen is of service to physicians in the diagnosis of intra-thoracic disease, the records of the past year have shown by numberless instances that it is no less valuable to surgeons by enabling them to make sure at a glance that the bones are in their proper relative situation without touching the splints or giving the patient a moment's pain. So far as surgery is concerned, nothing illustrates the immense improvement, which has been made in radiography in the course of the past year, better than the detection of renal calculi. Until this year the instances in which they had been photographed and verified by operation were few and far between. Now, thanks more particularly to the work of Mr. Mackenzie Davidson in this direction, the detection of renal calculi can be looked forward to with a fair degree of certainty, and, what is even more valuable, as saving patients from unnecessary operation, the evidence can be trusted equally well when it is negative. In all ordinary cases it may be said that if no calculus is seen there is no calculus there to see.

Resistance of Metals Under Pressure—Professor S. Lussana, of the University of Siena, has given, in *Nuovo Cimento*, an account of some interesting experiments which he has made upon the variations in electric resistance of metals under pressure. The metals used were silver, iron, nickel, copper, lead, platinum, manganin, nickelin, constantan, argentan and brass, the largest being 1.08 millimetres and the smallest .06 millimetre in diameter. The pressure used was carried up to 1,000 atmospheres in the case of the nickelin wire, but in the other cases only to 500 atmospheres, or about 7,500 pounds per square inch. Observations were made at ordinary temperatures, and were reduced to a standard temperature in order to accurately measure the coefficient of change in each wire. The test wires were immersed in oil contained in a gas liquefying machine of the Cailletet pattern, and were in the shape of a double spiral wound on an ebonite cylinder, which carried a thermo-electric couple for the determination of the temperature of the oil. The resistance of the wires was measured in the usual way with a Wheatstone's bridge. The conclusion reached by the author is that the electrical resistance of metals and alloys diminishes with the increase of pressure according to a coefficient, which itself diminishes with increasing pressure. This diminution is due not only to the nearer approach of the molecules of the substance, but also to a variation in molecular velocity. Pressure brings about both a temporary and a permanent variation of resistance. The first is quite strong, and depends upon the duration of the previous condition of the substance experimented upon, while the second is slighter, and depends only upon the amount of the pressure to which the specimen is subjected. The variation of resistance by pressure is relatively greater in pure metals than in alloys, and seems analogous to the change in the coefficients of temperature and expansion already noticed.

Admiral Dewey and the Manila Cables.

Captain Coghlan is authority for an interesting story of the taking of Manila. "Dewey," he says, "sailed into Manila Harbor, fought his battle, and then cut the cable. The English admiral wanted to help, but he didn't dare. But he thought that Dewey might take a hint. So the English admiral sailed over to Dewey and said, 'Ah, I see you have cut a cable.' 'Yes,' answered Dewey. 'Which one?' asked the innocent English admiral. And then Dewey, knowing for the first time there were two cables, rustled back, grappled for the second cable, and cut it."—*Argonaut.*

Mr. Luther Stieringer, the well known expert in decorative lighting, has received the appointment of consulting electrical engineer to the Pan-American Exposition to be held at Buffalo, N. Y., in 1901.

OPENING OF THE NATIONAL EXPORT EXPOSITION.

FORMAL INAUGURATION OF THE EXHIBIT OF AMERICAN MANUFACTURES FOR EXPORT, AT PHILADELPHIA, THURSDAY, SEPTEMBER 14.

In the presence of about 20,000 spectators the National Export Exposition, at Philadelphia, was opened with imposing ceremonies on Thursday, September 14. A great parade through the streets of the city escorted the Governor of Pennsylvania, the Mayor, numerous civic officers, Admiral Sampson and the officers of the North Atlantic Squadron, and many distinguished citizens identified with the promotion of the exposition to the main auditorium in the buildings. Here a great chorus of singers furnished the music, while orations were made by the Governor, Director-General Wilson, of the exposition, the Mayor and several others. It is worthy of special notice that the prayer of dedication offered by the Reverend Dr. K. B. Tupper was unique in meaning and brevity, consisting only of this sentence: "Lord, we ask Thee to let Thy face shine upon us this glorious day." A feature of the exercises was the reading of the following telegram from President McKinley:

"The opening of the National Export Exposition marks another important and gratifying advance in the extension of our trade and commerce and the promotion of more cordial relations in these respects with other nations. Accept for yourself and your associates my hearty congratulations and best wishes for the abundant realization of your most sanguine hopes for success and influence of this undertaking."

The principal feature of the opening ceremonies was an oration by Congressman Hepburn, of Iowa. Among other things Mr. Hepburn said:

"The last two years have been somewhat exceptional years, it is true, but they have astonished mankind. They show that our general exports have exceeded our imports by about $1,200,000,000, and that in manufactured articles our exports exceed our imports by nearly $100,000,000 in value. What infinite encouragement there is for us in the balance-sheet of the world's trade for the last two years. But there are many of our people who stand with foreboding and fear. They are apprehensive that evil will come to us from the expansion of our territorial limits. But why fear? Expansion has been the history of the progressive nations since Columbus sailed. Where is there advantage in discovery and exploration if they are not to be utilized by expanding old limits for the inclusion of the new lands. Is Great Britain less powerful to-day, with her 10,000,000 square miles of territory, than when limited to the 59,000 square miles of England, Ireland and Scotland?

"The present area of the 13 original colonies is but 350,000 square miles. Have we lost in power by throwing our flag over Louisiana, Florida, Texas, the grants from Mexico, Hawaii, Alaska, Porto Rico and the Philippines? Seventy-five millions of people require more room than 3,000,000. And 140,000,000—our population 40 years hence—will have greater needs than our present generation."

At night there was an illumination of the region surrounding the City Hall and the Avenue of Fame, which consists of a colonnade along Broad street for some hundreds of yards, but the effect of this was somewhat lessened by what the local newspapers call a "pitiful dearth of light." It is said that this was due to a lack of appropriations.

A VIEW OF THE NATIONAL EXPORT EXPOSITION BUILDINGS AT PHILADELPHIA.

Mr. W. S. Andrews, of the General Electric Company, recently found his X-ray apparatus of great practical value, having been sent for in haste to go to Ballston, New York, near Schenectady, where Dr. Ronald Smith had accidentally shot himself in the foot while at target practice. The local surgeons could not find the bullet, but Mr. Andrews located it immediately and it was at once successfully extracted.

PERSONAL.

Mr. J. F. Keelyn, president of the Western Telephone Construction Company, of Chicago, visited New York city last week.

Mr. Charles A. Coffin, president of the General Electric Company, returned last week with his family from Europe, coming over on the "Oceanic."

General Manager G. G. Ward, of the Commercial Cable Company, returned from Europe Wednesday of last week. Mr. Ward, with a number of other electrical gentlemen, was a passenger on the new ship "Oceanic."

Mr. A. M. Young, president of the New England Engineering Company, of Waterbury, Ct., and ex-president of the National Electric Light Association, has been a sufferer, for some time, from a bruise on his right hand. It became necessary for him to undergo a severe surgical operation, which was performed by Dr. Frederic S. Dennis at a private hospital in New York city last week. Mr. Young's wide circle of friends in the electrical field will be glad to learn that the operation was entirely successful, and through the skill and care of Dr. Dennis he will still retain the use of his hand, the loss of which at one time seemed probable.

Electrical Review

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News, Subscriptions and Advertisements.

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week, although it is occasionally possible to get in matter received on Monday.

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ELECTRICITY ON THE MAIN-LINE RAILWAY.

So much has been said and written about the application of electricity to heavy railway traction that the subject is almost threadbare, but it possesses a perennial interest if for no other reason than the magnitude of the engineering problems involved in it. Generally the assumption has been that the locomotive would soon have to give place to the electric motor, and that, in a decade or two, the "iron horse" would pass through the same melancholy stages of extinction to which the automobile has doomed his living prototype.

There is no reason whatever for this view of the matter, but, on the contrary, good reason to believe that the locomotive will hold its place for a long time. It is true that electric traction is less expensive than locomotive traction where there are many and frequent trains, but only within the limits of economical distance of power transmission. Taking a case where a central power plant supplies energy to railway lines in its neighborhood, the doubling of the lengths of these, of the transmission distance, would mean a four-fold increase in the cost of the conducting system. At a comparatively short distance from the generating station the cost of this reaches a point such that the superiority of electric traction vanishes.

For long-distance work, then, the steam locomotive can hold its own admirably; for short-distance, high-speed, frequent service, it is incomparably inferior to the electric system. The proper place for the electric equipment of railways is, consequently, wherever the trains are numerous, the distances comparatively short, the stops many and the speeds high. These are precisely the conditions offered by the suburban services radiating from every large city.

One thing is certain; the steam railway must either cheapen its suburban service through the use of electric traction or, in most cases, surrender its suburban patronage to competing electric lines. There is a broad and attractive field for electric railway engineers in the equipment of these short sections of heavily traveled lines.

There has been a great deal of talk about transatlantic telephony, and, while the problem is of vast difficulty, it does not seem entirely impossible of solution. In a recent paper, though, Mr. Spencer has pointed out that, since the minimum difference in time between any parts of the United States and Europe is five hours, the business days do not overlap. Hence, the day's work is practically over in England, for example, before it begins in New York. This, of course, works immensely against the value of the transatlantic telephone, but not more so than another consideration—that of cost. Assuming the cable to cost $5,000,000, and depreciation, repairs, interest, etc., to amount to the modest total of ten per cent, then, with two hours of actual use per day (all that reasonably could be hoped for), the rate for conversation would have to be over $7 per minute for the plant to pay expenses.

If Admiral Dewey had come home victorious from a foreign war twenty-five years ago, he would have been greeted with much the same enthusiasm that will be shown next week. There would have been the same bombs and cannonades, brass bands would have played and soldiers marched, and doubtless there would have been many bonfires and unparalleled display of fireworks and a mighty conflagration of red fire, but nowhere such a blaze of illumination as will greet the returning "Olympia." The electric light had not been made practical. Next week the electrical illumination will be a very magnificent feature of the fêtes in honor of the Admiral. A welcome to him in letters thirty-six feet high, will glow from the Brooklyn Bridge as he sails up New York Harbor, and the triumphal arch and colonnade in New York city will be ablaze with electric lights.

It is stated that Mr. Marconi, who is now on his way to this country, will give a highly practical demonstration of his system of wave telegraphy in connection with the "America's" cup yacht races next month. On a steamer, which will follow the yachts, he will have his transmitter installed, the receiver being aboard a cable ship anchored near the Scotland light-ship off Sandy Hook and in communication with one of the Mackay-Bennett cables. Messages describing the progress of the race will thus be received in New York and London simultaneously within one minute of the time of sending. It is to be hoped that there will be no fog or calm or other untoward conditions, and that both the racing yachts and the wave telegraph will have a fair chance to win new records.

The street railway strike in Cleveland, Ohio, is at last over. Its net results have been loss of wages to employés and a general paralysis of business, a short reign of terror, the mobilization of State troops at great expense, the death of several innocent citizens, destruction of property, encouragement of much bitter animosity, and an injury to the reputation of the city which it will take years of law-abiding peace there to repair. One of our English contemporaries, in commenting upon the situation, says: "We think that the sooner martial law is established in Cleveland the better. The least costly way to deal with strikers who go to such extremes is, as far as danger to life is concerned, to shoot the leaders of the strike at once."

In last week's issue of the ELECTRICAL REVIEW there was an account of the good work done for automobilism in that country by the Automobile Club de France. Between its exhibitions, its contests, its tours, its maps and guide-books, its encouragement of those wishing to establish charging-stations, repair shops and the like, it has really been the mainspring of the great progress that has carried France to the front in automobilism. If an organization of this kind can do so much good in France, it is certain that one would be of at least as much benefit here. Why not an American Automobile Association on the same lines?

ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

DETAILS OF THE ANNUAL CONVENTION HELD IN PHILADELPHIA LAST WEEK.

The programme of entertainment prepared for the delegates to the annual convention of the Association of Edison Illuminating Companies, at Philadelphia, last week, which was provided by the Edison Electric Light Company, of Philadelphia, was of an exceptionally enjoyable character. The theater party at the Chestnut Street Theater and banquet at the Hotel Bellevue, on Wednesday night, at which there were about 120 delegates and guests, was very enjoyable. Mr. Joseph B. McCall, of the Pennsylvania Manufacturing, Light, Heat and Power Company, presided at the banquet and entertained the company with a felicitous speech and sang the song "Brown October Ale." Vice-President Stetson, of the association, returned the thanks of the delegates and ladies accompanying them, for the most hospitable entertainment received. Calls were made for remarks by General Griffin, of the General Electric Company, who was present.

General Griffin, after congratulating those present on the excellent spirit of concord which prevailed among the members, went on to speak on the point which had been raised by Mr. McCall; *viz.*, the part played by electrical engineers in assisting the government during the late war with Spain. He was glad to be able to tell them that many engineering officers in the United States Navy had since spoken to him in appreciation of the work done by the volunteers who came forward to assist in laying submarine mines for the protection of the harbors along the eastern coast and in erecting apparatus on land, which required electrical skill. The suggestion originally came from Mr. Caryl D. Haskins, of Boston, who organized a corps of electricians for Boston harbor, to carry on the work under the superintendence of the engineer officers of the United States Army, who had charge there. Other corps were formed in other cities along the coast, particularly in New York, Philadelphia and Baltimore, and one United States engineer officer had remarked to him how easily and how efficiently these volunteers had done this work. He had replied that this was not strange, because it was in this case the army engineers who had been the amateurs, while the volunteer electricians had been the professionals, being accustomed to handle currents of much higher potential and to lay cables under water, as their daily work. He was also glad to be able to say that in all these volunteer corps the employés of the various Edison companies had been prominent. Two of the volunteers, while at work on the defences of New York harbor, were run down by a French steamer and lost their lives. One of these men was an employé of the New York Edison Company. He felt sure that all those present would agree with him that these two men had as truly offered up their lives for their country as if they had been among those who fell at the charge of San Juan Hill.

The following is the programme for the meeting: Tuesday, September 12. First session, 10 A. M. Roll call; President's address; report of executive committee; election of new members; report of lamp committee; report of Lamp Testing Bureau; Paper—"Lamp Renewal Methods," Mr. F. W. Willcox. Second session, 7.30 P. M. Papers—"Relation of Cash to Current," Mr. Charles R. Price. "Residence Lighting in Detroit," Mr. Alex. Dow. "The Wright Meter in Boston," Mr. A. S. Knight.

Wednesday, September 13. Third session, 9 A. M. Papers—"Polyphase Transmission and Distribution," Mr. G. Semenza, Milan, Italy. "The Use of Alternating Current for the Extension of Central Station Supply and for General Distribution," Mr. H. A. Wagner. "Methods of Meter Sales," Mr. F. M. Kimball. Fourth session, 2.30 P. M. Papers—"The Kern Gas Burner," Mr. E. A. Leslie. "Progress: Notes on Metering at Home and Abroad," Mr. Caryl D. Haskins. Report of Committee on Meters.

Thursday, September 14. Fifth session, 10 A. M. Paper—"The Electric Automobile," Mr. Fred R. Jenkins. Miscellaneous business; treasurer's report; election of officers. The meeting for 1900 was asked for by St. Louis and Columbus, Ohio.

Tuesday afternoon, at two o'clock, the delegates and ladies left the Hotel Lafayette, proceeded to the Arch street wharf and took a steamer to visit the warships anchored in the Delaware River, after which the party proceeded to Cramp's shipyards. In the evening a social meeting for the ladies was held in the Indian Room at the hotel, with vocal and instrumental music.

Wednesday morning the ladies visited the Academy of Fine Arts, the United States Mint and the shopping district. In the afternoon they took a drive through the city. In the evening the delegates and ladies attended the theater, with a banquet following.

On Thursday afternoon all in attendance at the meeting took a tally-ho drive through Fairmont Park, up the famous Wissahickon Drive, and to points of interest in the park. The local committee of ladies was made up as follows: Mrs. Martin Moloney, Mrs. Joseph B. McCall, Mrs. W. P. Conover, Jr., Mrs. A. J. De Camp, Mrs. J. H. Vail and Mrs. W. H. Johnson.

OLD TIME TELEGRAPHERS' MEETING.

REUNION OF THE OLD TIME TELEGRAPHERS' ASSOCIATION AND THE UNITED STATES MILITARY TELEGRAPH CORPS AT BOSTON, SEPTEMBER 12, 13 AND 14, 1899.

An exceptionally well attended and successful reunion of the Old Time Telegraphers' Association and the United States Military Telegraph Corps was held in Boston, Mass., on Sept. 12, 13 and 14, at the Copley Square Hotel. The time was largely given to social events and tours for sightseeing, which had been planned by the local entertainment committee.

President H. J. Pettengill opened the business session for the two associations at 10 A. M., Tuesday, by appointing a committee to wait upon Mayor Quincy, who was escorted to the platform, and, in a brief speech, welcomed the two organizations to the city. Colonel W. B. Wilson, of Philadelphia, president of the War Telegraph Corps, responded to the Mayor's welcome.

Business matters relative to the Old Timers' Association were then taken up, and it was voted to hold the next meeting in St. Paul and Minneapolis on the third Tuesday, Wednesday and Thursday in September, 1900. The election of officers for the Old Timers resulted as follows:

President, H. C. Hope, St. Paul, Minn.; vice-president, H. A. Tuttle, Minneapolis, Minn.; secretary and treasurer, John Bryant, New York; executive committee, J. J. Dickey, Omaha, Neb.; James Compton, Nashville, Tenn.; S. A. Duncan, Atlanta, Ga.; E. C. Cockey, New York; W. J. Denver, Boston; S. A. D. Forestall, Boston; J. W. Larish, Grant H. Yetman, Boston; E. A. Smith, Boston.

The reading of the treasurer's report showed a balance on hand for the Old Timers' Association of $777.97.

Immediately following the session of the Old Timers, Colonel Wilson called the meeting of the Society of the United States War Telegraph Corps. Several new members were admitted and the treasurer's report was read, which showed a balance of $38.27. It was voted to hold the next meeting at the same time and place chosen by the Old Timers for their next convention. These officers were elected for the society:

Colonel William B. Wilson, Philadelphia, Pa., president; William L. Ives, New York, vice-president; J. E. Pettit, Chicago, Ill., secretary and treasurer. Executive Committee: E. Rosewater, chairman, Omaha, Neb.; A. H. Bliss, Chicago, Ill.; A. B. Chandler, New York; W. R. Plum, Chicago, Ill.; George C. Maynard, Washington, D.C.; D. Wilmot Smith, Breckenridge, Minn.; R. B. Hoover, Springfield, Ohio; L. A. Somers, Cleveland, Ohio; J. D. Cruise, Kansas City, Mo.

Tuesday afternoon the two societies were entertained at dinner at Rocky Point by Geo. G. Ward, vice-president and general manager of the Commercial Cable Company. While there a telegram was sent to the cable terminal in Ireland, and an answer was received and delivered to the guests on their arrival at the hotel.

Wednesday evening the meeting was ended by a banquet at the Brunswick Hotel, at which 250 persons were present. Mr. Stephen O'Meara, editor of the Boston *Journal*, acted as toastmaster.

American Street Railway Association.

The exhibition space at the forthcoming convention of the American Street Railway Association, which begins in Chicago on October 17, promises to be completely occupied with a representative showing of street railway apparatus and appliances.

Secretary Penington has called for the names of representatives of all exhibitors, and states that their badges will be ready for delivery on October 17. The secretary also desires the names of ladies who will attend the meeting.

The Franklin Institute.

The electrical section of the Franklin Institute, of Philadelphia, announces the following lectures for October 3, at 8 P. M.:

Dr. Edwin J. Houston, Philadelphia, Pa.—"A Summary of Electrical Progress During the Past 75 Years."

Mr. Ralph W. Pope, New York—"The Influence of Such Societies as the Franklin Institute and the American Institute of Electrical Engineers in Promoting the Progress of the Electrical Arts."

Prof. F. B. Crocker, New York—"The Commercial Aspects of American Electrical Industries."

President John I. Sabin, of the Sunset Telephone and Telegraph Company, and other Pacific coast telephone companies, and President Charles J. Glidden, of the Erie telephone system, will sail for Europe on the "Lucania" on September 23. They will investigate the telephone systems of England, Germany, Sweden and France.

American and German Manufacturers Competitors for the World's Supply.

Lieut. Frank J. Sprague, the well known electrical engineer, returned from a brief European tour last week. Mr. Sprague had the honor of being the first passenger to land from the "Oceanic," the magnificent new Atlantic liner, and was surprised at the handshakes and greetings he received, as he stepped on the pier, from a multitude of waiting strangers, who took this means of welcoming the great ship to American shores.

Mr. Sprague was seen soon after his arrival at his office on Broad street. His chief object in going abroad was to see how the work was progressing in the installation of his immense electric elevators along the line of the Central London Railway (underground). The entire equipment of these elevators, which number about 50, and which are to be used in conveying passengers between the street surface and the stations underground, is shipped from this country, and the installation is proceeding most satisfactorily.

Mr. Sprague stated it as his belief, after visiting a number of leading manufacturing establishments in England, France and Germany, that the last-named country had become the real and chief competitor of the United States for the manufactured output of the world. Labor troubles had so embarrassed England, as well as lack of standardized product, that she had fallen behind her Teutonic neighbor. The finest factory Mr. Sprague saw in his travels was at Berlin, that of the Allgemeine Elektricitäts Gesellschaft. The German manufacturers early realized the necessity of uniformity and standardization, and their engineering work and their finished product have always been most thorough and workmanlike.

Mr. Sprague said there was much feeling expressed on all sides in the Dreyfus case, and he thought the decision of the court martial could not fail to have serious results for the Paris Exposition, particularly as regards English and German exhibitors.

A New York syndicate has completed the purchase of the City Passenger Electric Railway, the Logan Valley Electric Railway and the Altoona Gas Company, from John Lloyd, of Altoona, Pa., the principal owner. The consideration was $1,000,000. The Logan Valley and City Passenger stock, $50 par, was sold at $62.50, and the gas stock, $20 par, at $33.33. All holders will have an opportunity to sell their stock at the same rate.

Professor Bunsen and His Numerous Decorations.

The late Professor Bunsen thought more highly of his scientific discoveries than he did of the many orders and other tokens of honor that were showered on him during his long life. He was apt to forget to put on his crosses and ribbons when invited to official ceremonies, and his housekeeper tried to remind him of his duty by putting his various orders in the pockets of his dress suit trousers. On one occasion, says the *Berlin Börsenscourier*, he was invited, with the other Heidelberg professors, to dine with a Baden prince. He entered the room late, after the guests had assembled, and one of his colleagues turned to him and said: "Excuse me, Herr Geheimrath, but what have you done with your orders?" Bunsen was taken aback; he thought for a moment and then, plunging his hand into his left trousers pocket, pulled out a fist full of stars and crosses. As soon as they recovered from their astonishment every one began to laugh, but Bunsen said good-naturedly, "Oh, I have a lot more," and pulled another handful out of the right-hand pocket of his trousers.

Aluminum in Electric Railway Work.

TO THE EDITOR OF ELECTRICAL REVIEW:

I was very much pleased to see, in a recent issue of the ELECTRICAL REVIEW your article discussing favorably aluminum for electrical conductors. On the inter urban road, which is being built between Kansas City and Leavenworth, they are using 76 miles of 350,000 circular mils aluminum cable, purchased from the general manager of the Pittsburgh Reduction Company. The field for aluminum has appealed to me so strongly that I am now devoting myself to the sale of aluminum wire for electrical conductors. Will you be kind enough to send me a dozen copies of your issue of August 30 with bill? R. A.

Cleveland, Ohio, September 9.

The Growth of the Telephone in the United States.

H.W. Poor & Company have issued a circular pamphlet showing the increase in the use of the telephone in the United States. In 1880 there were in use under rental of the American Bell Telephone Company 60,873 instruments; in 1881, 132,692, an increase of 71,819. In 1898 there were in the hands of licensees 1,124,846, an increase over the preceding year of 205,725. In 1885 the miles of wires used by the overhead, underground and submarine systems were 137,223; January 1, 1899, there were in use 1,158,900 miles of wire. The entire expenditure of all the companies using the Bell telephone at the close of 1898 for construction reached the enormous figures of $111,159,309.26.

The Walker Company.

News comes from Cleveland, Ohio, that the Standard Trust Company, of New York city, has begun foreclosure proceedings against the Walker Company on a claim for $175,000 bonds and $30,000 interest, and asks for a receiver on the claim that the Walker Company is insolvent. The Westinghouse Electric and Manufacturing Company has been in control of the Walker Company for some time, and this latest step is believed to be the final proceeding toward securing absolute ownership of the Walker Company.

Progressive Chattanooga.

[*From the Chattanooga, Tenn., Times*]

The ELECTRICAL REVIEW in a recent issue calls attention to the fact that in some places trolley companies are cultivating strips of lawn between the tracks, producing a most pleasant effect, so that it says, "grass in the streets is now a sign of progress rather than of retrogression." If this be true Chattanooga is one of the most progressive towns in the land, especially between the river and Fifth street.

NOTES ON LIGHT.

BY WILLIAM ROLLINS.

NOTE LXIII — PENETRABILITY OF X-RAYS INFLUENCED BY TEMPERATURE.

Edison and also S. P. Thompson found in 1896 that the penetrability of X-rays was increased by cooling the exterior of the vacuum tube. Edison surrounded the tube with oil, which was placed in a freezing mixture.

These observations have been confirmed by others and have been quoted as showing the incorrectness of the fact stated in Note xxx, that the wave-length of X-light depended on the temperature to which the particles of the cathode stream were raised by their impact on the target. There is, however, nothing inconsistent in these two facts. The reason why cooling the outside of the vacuum tube increases the penetrating power of the light is this—the vacuum is kept higher, therefore the velocity of the cathode stream is greater, resulting in shorter waves. The shorter the waves the denser the substance they will penetrate.

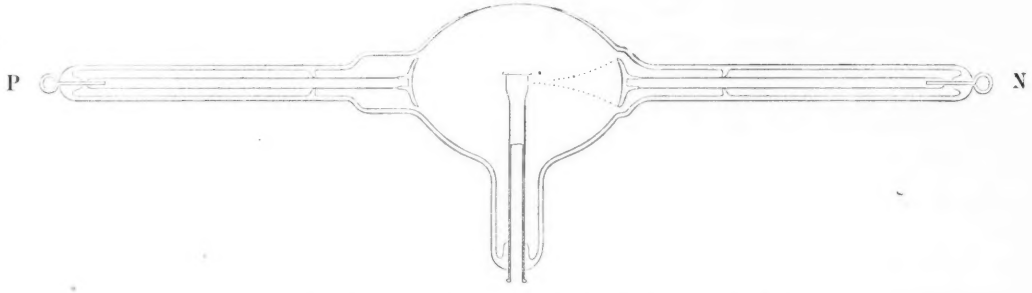


FIG. 58.—A-W-L TUBE FOR TESLA COILS AND ELECTROLYTIC BREAKS.

How great a difference temperature makes can be easily observed by any one who will read the gauge on the vacuum pump with the tube excited cold and again while hot. Moreover, with a focus tube it is a simple matter to show that cooling the exterior of an excited tube does not make much change in the temperature of the target against which the particles strike, and this is the place where X-light originates and where the temperature must be altered if we wish to study its effect on the character of the light.

NOTE LXIV—THE EFFECT OF THE DEGREE OF THE VACUUM ON THE TEMPERATURE OF THE TARGET.

One of the interesting things in connection with vacuum tubes used to produce X-light is to see, as the vac-

uum rises, the changes in temperature of the target where the cathode discharge strikes.

When the vacuum is about equal in resistance to one fourth of an inch of air, a powerful generator delivers so much force against the target as to quickly melt it, the platinum flying off as shooting stars of glowing metal,* and there is so much light that it is easy to read ordinary print several feet from the tube.

If, however, we stop the current in time to save the target, and go on pumping, we arrive at a stage where the same generator can not make the target more than red hot; and when we get up to a vacuum equal to 16 inches of air, it is impossible, with the same generator, to make the target even red. Yet, keeping pace with this increase of vacuum, the penetrating power of the X-light rises. As the vacuum rises, a greater proportion of the energy appears as X-light and less as ordinary light and heat. Therefore, where it is practical to use high vacuums and obtain the necessary differentiation of tissues, it is desirable to do so, on the ground of economy.

At first high vacuums in new tubes were not desirable, as they soon became too high, and useless; but with the introduction of the intermolecular vacuum regulator this difficulty was overcome.

To restate the matter in a different way, it may be said that a vacuum tube is a source of heat, light and X-light, according to the degree of the vacuum and the energy of the current, and what occurs is this: As the vacuum rises, the number of particles to carry the current is less, but, as the current must be carried, each particle moves with greater velocity and, striking the target with greater force, gives rise to a larger proportion of short waves; that is, of X-light, and a smaller proportion of longer waves, or those of ordinary light and heat.

NOTE LXV—X-LIGHT TUBES FOR ELECTROLYTIC BREAKS.

When we use an electrolytic interrupter to excite a single focus tube, the definition is less perfect and the tube blackens sooner than with the usual forms of interrupters. By a single-focus tube I mean one where the anode, acting as a target, receives the discharge of a single concave-cathode, in whose focus† the anode is placed, X-light originating at the small area where the cathode discharge strikes.

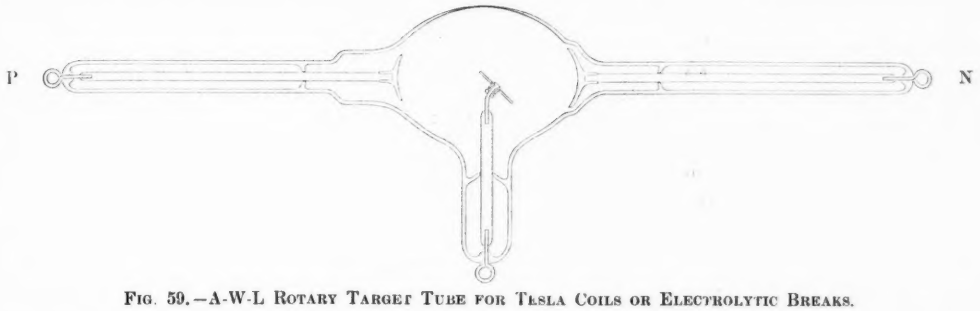


FIG. 59.—A-W-L ROTARY TARGET TUBE FOR TESLA COILS OR ELECTROLYTIC BREAKS.

What causes this loss of definition? It is because a larger proportion of the particles leaving the anode have a velocity approximating that of the cathode discharge.

In other words, the alternating character is more marked, approaching more nearly to the type of discharge of a Tesla coil.

As a result, the particles forming the anode rush‡ strike the tube in various places with sufficient force to heat the individual particles to a sufficiently high temperature to make them centers from which X-light radiates. We therefore have in a more marked degree the phenomenon mentioned in Note xvii. It follows that the single-focus tube is not the best when the electrolytic break is employed. The double-focus tube is a better type for this form of interrupter. There are two forms of double-focus tubes, one invented by Prof. E. Thomson and the other by the writer. Professor Thomson's tube is far more economical, as it utilizes the discharge from both terminals, but, having two radiant areas for X-light, the definition is less perfect than the second form.

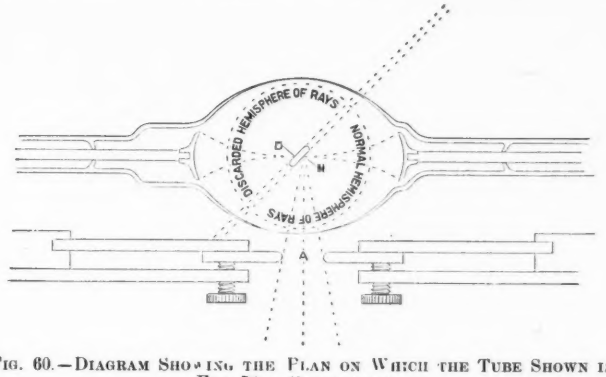


FIG. 60.—DIAGRAM SHOWING THE PLAN ON WHICH THE TUBE SHOWN IN FIG. 58 IS CONSTRUCTED.

A modification of Prof. Thomson's tube suitable for use with electrolytic breaks was mentioned in Note xvii, and in Fig. 61 is shown the same tube in a later form.

For much medical work, extreme definition is of less consequence than the amount of light, so this tube is an excellent type for Tesla coils and for use with electrolytic breaks.

When the most perfect definition is required with Tesla coils or with electrolytic breaks at a sacrifice of some light, the tube figured in Note xvi is suitable. In Fig. 58 accompanying this note is shown a more recent type of the same tube, improved in mechanical construction and more efficient.

In Fig. 59 my rotary target is shown applied to a tube of this form.

As stated in Note xvi the light from the second area or that from the back of the target is thrown out of the field, leaving but one radiant area, which being of small size may be considered as a single point from which in every direction X-light is given off. In Fig. 60 I have drawn a diagram showing the plan on which the tube shown in Fig. 58 is constructed. N shows where the normal cathode stream strikes the target and gives rise to a sphere of light, half of which is cut off by the platinum. Of the resulting hemisphere I use only a cone of X-light which comes through the opening in the diaphragm which is shown more in detail in Note xxxvi. D represents the point where the abnormal stream of particles strikes the target and from which X-light also threads out as a sphere, half of which is cut off by the platinum.

The resulting hemisphere can not pass through the diaphragm, and, in consequence, can not blur the definition.

I made the drawings some time ago, so naturally, the tubes have undergone changes since, but these are chiefly to make it easier for the glass blower.

It remains to consider why there is increased blackening of a single-focus tube when the electrolytic interrupter is used. It is due to the greater number of particles of platinum torn off from the anode. With the double-focus tubes both terminals are aluminum, and the particles torn off from the U and deposited on the glass do not discolor it so much.

On this account also the double-focus tubes are superior where Tesla coils or electrolytic breaks are used.

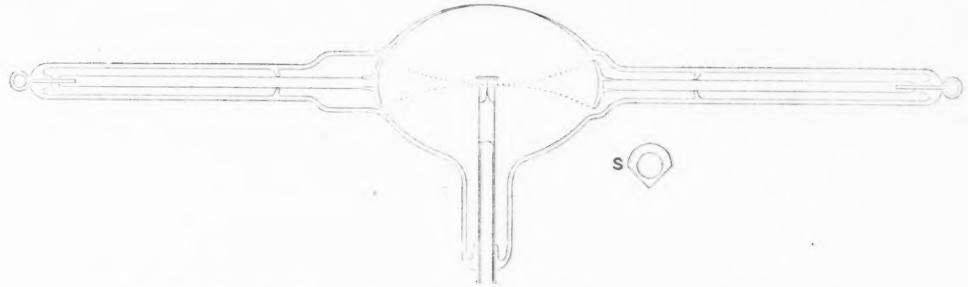


FIG. 61.—COOLED TARGET APPLIED TO PROF. E. THOMSON'S DOUBLE-FOCUS TUBE.

*Note xlvi.

†Note ii—ELECTRICAL REVIEW, December 15, 1897.

‡Note xxi—February 9, 1898. Note xlvi—February 8, 1899.

Wall Street and the Electrical Stock Market.

The feature of the current week was the tight money market, which resulted in a liquidation of speculative holdings in considerable volume. It is believed to be probable that a considerable portion of these holdings have found their way into the hands of persons or institutions who have not been affected by the stringency in the money market. Of course, the situation of the stock market has been materially strengthened by reason of this speculative liquidation. The state of trade is still remarkable, and it seems impossible to fix the limits for the expansion in the home and foreign trade of the country. This, of course, indicates the stability of the security market. The scarcity of money, which threatens to develop into a menace to the country's trade, and the great national prosperity which nearly every line of industry is experiencing, constitutes a paradox.

On the New York Stock Exchange General Electric closed the week at 121 bid and 121½ asked, a loss of 1½ points for the week. Metropolitan Street Railway, of New York, closed at 193½ bid and 194 asked, a loss of 17 points for the week. Third Avenue Railroad, of New York, closed at 185 bid and 187 asked, a gain of 1 point for the week. Brooklyn Rapid Transit closed at 88 bid and 88½ asked, a loss of 16⅛ points for the week. It is asserted that unexpected expenses will use up practically all the Brooklyn Rapid Transit earnings, which had been counted upon for dividend purposes in the near future. It is also rumored that the control of the road has changed hands, and that the Whitney-Widener-Elkins syndicate have been large purchasers of the stock. People on the inside, however, are asserted to have been buying the stock confidently.

On the Boston exchange American Bell Telephone closed at 361 bid and 365 asked, a gain of 2 points in the bid price for the week. Erie Telephone closed at 108½ bid and 109 asked, a gain of 4 points for the week.

On the Philadelphia exchange Electric Storage Battery common closed at 133 bid and 140 asked, a loss of 5 points for the week. Union Traction closed at 40½ bid and 40¾ asked, a loss of ⅞ point for the week.

On the curb or outside market in New York Electric Vehicle closed at 100 bid and 105 asked, a loss of 3 points for the week. Electric Boat closed at 20 bid and 24 asked, a loss of 1 point for the week.

Wall Street, September 16.

Dividends.

The directors of the General Electric Company have declared a regular quarterly dividend of one and one-half per cent on the common stock, payable October 14 to stock of record October 3.

The Westinghouse Electric and Manufacturing Company has declared the regular quarterly dividend of 1¾ per cent on the first preferred stock, payable October 3 to stock of record September 23.

The directors of the Commercial Cable Company have declared a quarterly dividend of 1¾ per cent on the capital stock of the company, payable October 2 to stockholders of record September 20.

The Providence Telephone Company, of Providence, R. I., paid, on September 2, its usual quarterly dividend of $1 per share, and voted to increase its capital stock from $1,000,000 to $1,200,000 after October 15.

The directors of the Western Union Telegraph Company have declared a quarterly dividend of 1¼ per cent on the capital stock of the company payable on October 16 to stockholders of record September 20. The annual meeting of stockholders will be held on October 11.

The board of directors of the Electric Vehicle Company have declared a dividend of two per cent on the common stock, payable October 2, to common stockholders of record at the close of the transfer books on Wednesday, September 20, 1899. The transfer books will close on September 20, 1899, and will reopen on October 5, 1899.

Wave Telegraph Courtesies.

A press despatch states that on September 13 the British Association for the Advancement of Science, then in session at Dover, England, successfully exchanged courtesies with the French association of the same name, in session at Boulogne-sur-Mer, using the wave-signal telegraph for the purpose.

Deterioration of Acetylene.

According to a German contemporary, acetylene, when kept in a holder for a few days, falls off in lighting power, this deterioration being evident even after a period of 12 hours.

Prince Cantacuzene, who is to wed Miss Julia Dent Grant, is becoming an adept in the art of handling an automobile at Newport.

Electric Smelting of Iron.

The Stassano process for the production of iron and steel depends upon the application of the heat of the electric arc to the purpose of reducing oxides of iron and to melting the resulting metallic mass, says the London *Colliery Guardian*. The electric furnace employed is formed by the juxtaposition of two truncated cones by their bases, a third cone of similar formation being connected with the body of the furnace thus formed, and constituting the crucible in which the fused metal collects, and which is withdrawn by means of a tap-hole. At a point somewhat above the opening of the crucible thus formed, and within the furnace itself, are two cylindrical carbon electrodes, 10 centimetres diameter and one metre in length. The distance between their terminals—the length of the arc—is regulated from time to time by a contrivance worked by hand, in accordance with the indications furnished by the voltmeter and amperemeter, and is closed off by a hopper to exclude contact with the external air, but which has two outlets for the escape of the gases, notably carbonic oxide, resulting from the reduction of the ores used. The minerals charged are oxides, or carbonates, the latter undergoing a preliminary calcination. They are first pulverized, and the gangue, etc., is separated as far as possible from the metallic particles by magnetic means. An analysis is made in order to determine with exactness the proportion of carbon, lime and silica necessary to reduce the mixture and slag off the impurities during the subsequent operations, and obtain a metal of predetermined constitution. The necessary quantities of the above are then powdered and intimately mixed with the concentrated ore, 5 to 10 per cent of tar being added. The resulting paste is submitted to a pressure of from 200 to 300 kilogrammes per cubic centimetre in a hydraulic press, and the mass thus formed is broken in a special pug-mill into pieces, these pieces forming the ultimate charge for the electric furnace. When it is desired to produce an alloy of iron with some other metal, ores of the latter, in the necessary quantity, are added to the mixture previous to the pressure in the hydraulic press. At the intense heat developed by the electric arc (3,500 degrees centigrade) the Fe_2O_3 is decomposed, forming with the carbon present CO_2, which is, itself, subsequently reduced. The CO formed escapes to the upper portions of the furnace, where it aids in the reduction of the metallic oxides, while the reduced metal, associated with more or less carbon, collects in the lower cone before mentioned. The impurities slag off and are tapped from a hole in the upper portion of the crucible. In one form of the furnace the operations can be carried out continuously, the withdrawal of the melted metal, and the charging of fresh mineral taking place periodically, the latter being fed through an opening in the upper portion of the furnace. To produce one metric ton of iron or steel, from 1,600 to 1,700 kilogrammes of fuel are required, according to the carbon contents of the description used. At 20 francs ($4) per ton of coke the fuel cost of producing one ton of metal is 33 francs ($6.60). In the Stassano process, the energy required for one ton of metal is 3,000 horse-power-hours. This amounts to an average of 18 francs, which, it is claimed, is 15 francs cheaper than in the ordinary way of smelting. The cost of the preliminary operations is certainly greater than in the other processes, but this is compensated for by the lessened cost of smelting.

The Maintenance Company.

During the past year a unique corporation, with a novel, but utilitarian, proposition as its text, has been added to the kindred interests directly allied with the electrical industry. It is the Maintenance Company, 220 Broadway, New York city, which expects to establish the same relations with owners of electrical apparatus that the Hartford Steam Boiler Inspection and Insurance Company holds with the owners of steam boilers. The company maintains a force of experts who examine and maintain electrical installations by yearly contract. The form of contract issued by the company guarantees the purchaser against loss by accidents to electrical machinery, and, it is asserted, many manufacturers are recognizing the advantages of such a system of guarantee. When a machine is sold by the builder and accepted for the purchaser by the Maintenance Company, the manufacturer's money is payable in full.

The capital of the Maintenance Company is $100,000, fully paid, and its contracts are guaranteed by a surplus fund deposited with the Colonial Trust Company, of New York city. The company's officers are Jas. J. McKenna, president; Ernest R. Bartlett, treasurer, and Joseph M. Cooper, secretary.

The Municipal Electric Lighting Plant at Negaunee, Mich.

[*From the Daily Mining Journal, Marquette, Mich.*]

In order to ascertain the true value of the municipal lighting plant and the exact cost of the service furnished the city, the council some time ago employed Pierce & Richardson, of Chicago, to make an expert examination of the books and plant and report their findings. R. A. Richardson did the work. He inspected the books and made a careful examination into the conditions at the lighting station, devoting several days to the work and doing it in a painstaking manner. His report was presented to the council at the monthly meeting last night.

The report is of deep interest to every person in Negaunee. It shows that the true status of the plant has not been known heretofore, and that at present it is an expensive luxury. Mr. Richardson's report is in detail, and covers 10 typewritten pages. He first sets forth that there is great difficulty in ascertaining facts in regard to the water and lighting plants (which are operated from the same station), because three sets of books are kept for them. One set is kept for each plant, and in addition there is a set for the city department.

At the outset Mr. Richardson states that both plants are operated in one building, using the same fuel and supplies. It is difficult to ascertain exactly what part of the fuel and supplies each plant consumes, but it is Mr. Richardson's opinion that the water account has been loaded with charges that properly belong to the electric lighting account. He reports that, in the year 1897–98, the operating expense of the water plant was $4,497.44, with earnings of $7,392.19, giving a balance of $2,894.75 in favor of the plant.

In 1898–99 the operating expenses for the water plant were $5,884.88, and the income was $6,970.29, giving a balance for the plant of only $1,085.41. Mr. Richardson explains the discrepancy by stating that, in 1898–99, the electrical plant was installed. In 1897–98 $2,000 was spent on water mains. In 1898–99 only $648.60 was expended in the betterment of the plant, while the only legitimate increase in expenses was the addition of $10 a month to the salaries of two engineers.

In taking up the electric lighting plant, Mr. Richardson takes the year from April, 1898, to April, 1899, as a basis for his investigations. The report of the recorder for that period shows that the operating expenses of the plant were $3,919.02, compared with $4,651.15 in receipts, giving a balance of $732.13 in favor of the plant. Mr. Richardson says: "This statement is apparently true as far as moneys paid through orders from the recorder's office and moneys received at the recorder's office are concerned, but it is by no means a statement as to the cost per year of the plant to the city."

The cost of the plant to the city, as shown by the electric light books, March 15, 1898, is $11,692.82. Mr. Richardson reports that this is not a true statement, as he finds that, in September, 1897, $1,000 was transferred from the city fund to the electric lighting fund. This procedure was repeated in December, 1898, when $2,000 was transferred. In addition, bills from Engineer McRae on account of the lighting fund, which amounted to $662.75, were charged to the city tax fund. The total of these amounts, $3,662.75, must be added to the cost of the plant, which makes it $15,355.58 to date of April, 1898.

From 1898 to 1899, $836.44 was charged to construction. Fifty per cent of that amount should have been charged to running expenses. Deducting this amount from $4,757.96, the total expense of the plant for the year, April, 1898, to April, 1899, the running expenses were $4,339.74. Allowing five per cent for depreciation on the investment of $15,773.80, $1,577.38 has to be added to running expenses for the year, making a total of $5,917.12. This statement gives a deficit of $1,265.97, instead of an earning. Mr. Richardson shows that when other expenses, such as the increased cost of coal, are considered, the city is paying $114.49 a year for every arc light in use.

Mr. Richardson estimates that up to April, 1899, the plant cost the city $23,198.96. In the same period the receipts were $6,524.43. He then takes up the question of rates and unsparingly denounces the system of flat rates now in use. He states that the city will never be able to put the plant on a paying basis unless meters are used, with a sliding scale of discounts. The equipment of the station he reports in fair condition, although the armature of the arc machine has been badly overheated and is liable to give way. He notes the fact that many appliances provided for in the specifications for the plant were omitted because funds were short.

Mr. Richardson outlines a scheme of bookkeeping which would keep the accounts of the two plants distinct, and which should be adopted if the taxpayers are going to know anything of what each plant is doing. Only by changing the present system can the affairs of the plants be put on a business basis. Mr. Richardson's summary of his report is as follows:

A. That the electric light plant ran behind $1,265.97, instead of making $732.13, as shown by the report of April, 1899, for the fiscal year.

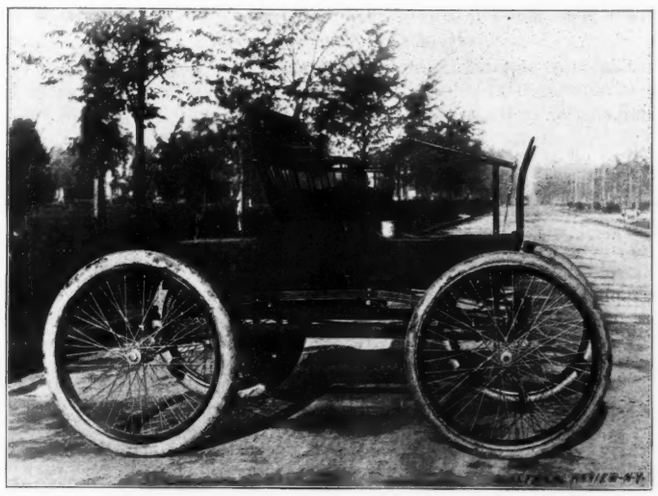
B. That a very considerable amount charged to operating expense of the water plant was expense which should have been charged to the electric light plant.

C. That the city plant can never be put on a paying basis until it raises its rates and increases its output.

D. That the actual cost per year for operating individual plants can not be known until meters are put in and records kept.

E. That the cost of operating each arc lamp for the last fiscal year was $106.49, as figured from the present records.

F. That the method of charging for lamps on a flat basis is wrong from a commercial or business standpoint, unless rates are put so high as to absolutely protect the station, which would make it very expensive for the consumer who does not waste his lights or use them to any great extent.



SAUL & VAN WAGONER'S ELECTROMOBILE.

A New Automobile Manufacturing Firm.

A new firm will shortly inaugurate in Syracuse, New York, an automobile manufacturing business, putting both electromobiles and gasoline machines upon the market. The firm will be composed of Messrs. C. F. Saul and Wm. Van Wagoner. Both these gentlemen have had long and complete experience in the bicycle trade, both having been connected with it since its beginning.

The illustration shows an experimental electromobile which has been in constant service for some time. This is the prototype of the machines that will be manufactured, the outward appearance of electromobiles and gasoline automobiles being the same.

A New Cable Head Protector.

The Eureka Electric Company, of Chicago, are placing upon the market a new and improved combination cable head protector. The company claims for this device that it will be a protection to telephone exchange switchboards from sneak and strong currents. It is so constructed that a heat coil can be used, or, if desired, a fuse coil. The company is also at the present time at work upon a novel type of bridged extra strength toll-line cabinet telephone, which they will build in two strengths, one for ringing 25 telephones upon a bridged toll line, and the other to ring loudly and clearly any number of telephones up to 50 instruments upon one bridged line.

SUNBURY, PA.—The Penn Telephone Company proposes to run a line from Selinsgrove to Port Trevorton, thence across the Susquehanna to Herndon, connecting Mandata, Mahanoy, Georgetown, and ultimately connecting the Lykens Valley, Perry County and Juniata County lines.

The Sterling Electric Company.

The year 1899 has been one of unusual activity and growth in all branches of electrical industry, and notably so in the telephone field.

All manufacturers of apparatus have enjoyed an unprecedented amount of business, especially those whose claim on patronage relied more on the quality and excellence of their product than on low prices. Among these is the Sterling Electric Company, of Chicago, Ill. This company is one of the youngest in the field, having been incorporated in February, 1898, with Frank B. Cook, of Chicago, as vice-president and chief engineer, and Walter E. Doolittle, secretary and general manager.

Mr. Cook had for years held the position of chief engineer with the Central Union Company (a Bell organization), and while in that position contributed largely to the development and improvement of Bell apparatus.

Appreciating the difficulties under which independent companies were working in endeavoring to compete with the old company in exchange service, these gentlemen realized the immense benefit apparatus of "Bell" type and quality would be to the former, and in March of last year began manufacturing and supplying such apparatus under patents owned and controlled by them.

The result has been most surprising, and must certainly be highly gratifying to the incorporators.

Beginning business 18 months ago with nine men, in limited quarters, the company to-day employs regularly about 150 hands, and for some time has been working night and day, requiring practically double the above number. In spite of all efforts, however, they are still unable to properly take care of their constantly increasing business and find that further expansion is forced upon them. With this end in view they have decided to add a large factory at Lafayette, Ind., which will be in operation by or before November 1, and which will, it is stated, make the Sterling company the largest manufacturers of independent exchange apparatus in the West. At least 500 hands will be employed and an aggregate of 50,000 square feet of floor space occupied.

The rapidity and spontaneity with which the growth here chronicled has been achieved speaks highly for the value of the product of this company as well as for the executive ability exhibited in its management. The leading features of their manufacture at present are their Bell type switchboards—standard and sectional—pole-top and office terminals, arresters and protective devices (which are guaranteed and are approved by the National Board of Underwriters) and kindred apparatus.

LITERARY.

Professor Elihu Thomson's lecture on "Electricity at High Pressures," delivered before the New York Electrical Society, is now published by the society in pamphlet form, through the subscription of its members, having been carefully prepared and revised for press, and will be forwarded on receipt, by the secretary, of 25 cents for each copy required. An extra large edition has been printed for the accommodation of those who wish for copies for distribution among their friends, and also of those who may find $1 a more convenient sum to remit than 25 cents.

Another Carbon Plant?

It is rumored that Mr. Hugo Reisinger, of New York city, manufacturer of the well known "Electra" Nuernberg carbons, has secured options on a large tract of land in New Jersey, and that he will erect on it a big carbon manufacturing plant. It is said that a syndicate of European capitalists is behind the scheme, and that the new company will be an important factor in the electrical field.

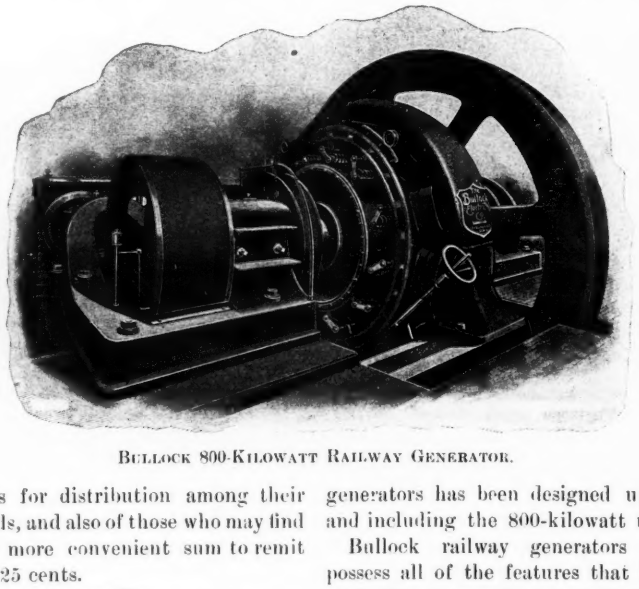
An Old Overhead Wire Suit Settled.

Justice Russell, of the Supreme Court, has decided the long pending suit of the Electrical Power Company, of New York city, against the city of New York, for $250,000 damages for the removal of its overhead wires, by the city in 1889. The court gave judgment against the city for $6,000.

A New Street Railway Generator.

"What is worth doing at all is worth doing well" is a maxim that has been constantly observed by the Bullock Electric Manufacturing Company, of Cincinnati, during the 10 years of its existence. As a result, Bullock motors and generators have become famous the world over as being thoroughly reliable and up to date. Their business increased to such an extent, that in 1898 they determined to erect a new works which was occupied in January of the present year, and which from the present outlook will soon have to be enlarged.

Encouraged by this success, the company has now determined to enter the railway field. To this end, a complete line of engine-type railway generators has been designed up to and including the 800-kilowatt unit.



BULLOCK 800-KILOWATT RAILWAY GENERATOR.

Bullock railway generators will possess all of the features that have made the company's present standard machines so popular, and also some new features.

Among the more important may be mentioned a scheme for oscillating the brush-holder mechanism in a direction parallel with the shaft. The movement is very slow and results in constantly changing the line of travel over the commutator face and thus removes all tendency to cut or groove the latter. The action is the same as secured by the end play of an armature in a belted generator or that produced by the electro-magnetic device used at the end of the shaft on rotary transformers, and which is recognized by engineers as a means of greatly prolonging the life of the commutator.

The pole-pieces and coils may be removed without disturbing the yoke or armature, and, with two of them removed, it is possible to remove one or more armature coils should repairs be necessary.

The armature coils are made of continuous bars of copper, without joints between the commutator connections, which materially adds to the life of the machine. These coils are all thoroughly insulated, pressed and baked before being placed on the core, no additional core insulation being necessary.

All armatures are thoroughly ventilated by slots perpendicular to the shaft through which the air rushes when the machine is in operation.

A liberal rating permits of constant operation at full load, with low temperature rise.

One of the 800-kilowatt machines has been sold to the Oakland Rapid Transit Company, of Oakland, Cal., and is shown in the illustration herewith. This machine operates at a speed of 80 revolutions per minute, and at this speed develops 550 volts at no load.

It is over compounded for a rise of 50 volts at full load, making the full-load voltage 600. Bullock railway generators are fully described in Bulletin 0734, sent on application.

BUSINESS NOTES.

"'**Wanted, able-bodied men** to help us fill orders' is the cry around this establishment," said Secretary Dinsmore, of the Columbia Electrical Supply Company, of Liberty street, New York. The customers in line, and the general hum of industry at the headquarters of this enterprising electrical house was evidence in proof of the remark. The electrical supply business in general is very active.

Notice has already been given of the removal of the Chicago Rheostat Company from Chicago to New York. Branch offices, with a large and well assorted stock of rheostats, will be maintained at 1012–1013 Monadnock Block, Chicago, to accommodate a well developed western business, but the factory and main office will be in New York, in charge of Mr. E. W. Hammer, at 397 to 407 East Thirty-third street. While the growth of this company has shown a splendid increase, it is believed that the domestic business can be handled as well from New York, with a decided advantage in the handling of foreign trade. Other offices of the company can be found on reference to our advertising pages.

W. S. Rowe, cashier of the First National Bank, of Cincinnati, has bought the Columbus Central Railway for $1,300,000 at a master's sale. This is understood to be in the plan for consolidation with the Columbus Street Railway. Rowe's bid was $213,000 above the appraisement, or $574,000 more than the upset price.

THE LICENSING OF EMPLOYÉS ON ELECTRICAL WORK, AND IMPROVING THE QUALITY OF WORK AND MATERIAL.*

BY CAPT. WILLIAM BROPHY.

(Concluded from page 175.)

Last, but by no means least, comes the fire and police signal service. There is no branch of the municipal service that equals these in importance, as bearing on the safety and welfare of the community, except the fire and police departments of which they are the nervous systems.

When a commercial telegraph wire fails, another, going in the same or some other direction, is substituted therefor, even though the distance traversed may be twice or thrice as great as that traversed by the disabled circuit. A notable instance of this kind came under my own observation during the great fire of November, 1872, in Boston, when a message sent to my house, 44 miles distant, had to be sent by way of Montreal, Canada, as the trunk lines in the city going south and west were destroyed.

When a telephone circuit becomes inoperative the subscriber can wait until it is repaired; he and those who wish to communicate with him being the only ones who are in any way inconvenienced; but when a policeman or citizen discovers a fire in progress and pulls the box, they expect it to operate correctly every time; if a prompt response is not made they do not realize something is wrong and must try another box. Often the pulling of the box is repeated, all to no avail if the circuit is open or the box or other apparatus inoperative, while in the meantime an incipient fire may be making rapid strides towards the proportions of a conflagration.

The police officer whose duty it is to preserve the peace, guard our property, hold in check the unruly, arrest the criminal, protect the weak, care for and succor the injured, in order to perform the duties imposed upon him must have a signal system on which he can place implicit reliance; if not, valuable lives may be lost or much unnecessary suffering endured, his own life endangered or lost, and criminals escape the heavy hand of blind and sometimes tardy justice.

Can any one for a moment contend that these two important systems should not be constructed in the best possible manner and maintained in the highest state of efficiency? Should any but the most competent persons be placed in charge thereof? And should they not be given the very best and most competent men as assistants? These are questions that can be answered only in the affirmative by any public official or private citizen if they will only familiarize themselves with the workings of both of these systems.

Without at this time attempting to combat the belief that exists in the minds of the active politician, that "to the victor belongs the spoils," I do contend that the position of superintendent of fire and police telegraphs should not be counted among the assets of the spoilsmen. While it is perfectly proper that these officials should be selected from among those of the same political creed as the appointing power, they should be qualified in every way to perform the duties, and should be obliged to prove their ability before some authorized person or board competent to decide impartially, and who possess the respect and confidence of all classes in the highest degree, and whose certificate of license should be of value to the holder.

The time has come when municipalities must undertake the supervision of all classes of electrical construction; many are already doing so. The superintendents of fire and police signal systems, particularly in medium and smaller cities, should be qualified to undertake such supervision, as, in most cases, they will be called on to do so. For them to accept such a position through false pride or an increase in salary, knowing themselves to be incompetent to supervise the work of what ought to be the most intelligent class of electrical workmen, and others not over scrupulous, would, in my opinion, be a crime, and to appoint them under such conditions would be one, only in a less degree.

For this reason it behooves all superintendents of fire and police telegraphs to become familiar with all known methods of generation and distribution of electrical energy, both of high and low-tension currents.

Having tried to show you the possible dangers resulting from the generation and distribution of high-potential currents, also those of lower potential but of large volume, I will now endeavor to point out the necessary qualifications of men engaged in some classes of electrical business, and in doing so I will follow in the lines established by the New England Electric Exchange, an organization formed and supported by men engaged in electrical pursuits some years ago, for the purpose of maintaining a high standard of workmanship and intelligence among the fraternity. As a result of the good work done by that organization, all classes of men sought, and, when possible, procured, one of the five classes of licenses issued by it.

These certificates proved a sure passport to a position for the holders thereof, and nearly all the officers of electric light, railway and power companies and contractors required their employés to appear before the examining boards and obtain one of the licenses (five in number) if they wished to remain in their employ; and, as a rule, the holders of such licenses were sought for by those needing the service they could render in preference to others.

This system of licensing proved a blessing in many ways: it insured the highest grade of intelligence in the different grades of work; it proved an incentive to young men to attempt to reach the highest round in the ladder. I know it to be a fact that many who were only able to secure a rating that entitled them to the lowest (5th) class license worked and studied until, step by step, they reached the highest, or close to it. The contractor and manager obtained the best workmen; firms and corporations secured the best class of men for superintendents and managers, and best of all, the public received all the protection possible from dangers that might arise from the distribution of electrical energy.

The work and influence of this organization was not confined to New England; men came from all parts of the country, either at their own or their employer's expense, presented themselves for examination, and received licenses, if entitled to them, that were valued very highly.

The number that applied for a first-class license was quite large, but the number that received them was somewhat limited. The qualifications of the applicants were as follows:

The applicant for a first-class license had to be able to make working plans of central stations and isolated installations; to have a general knowledge of the construction of dynamo electric machines, and the electrical appliances necessary for electric light and electric power installations; a general knowledge of the principles, construction and installation of secondary or storage batteries; a thorough knowledge of the insurance rules pertaining to the business; a specific knowledge of the systems operated by the applicant, and a thorough knowledge of the calculations necessary for, and the rules governing electric wiring, and be able to make complete wiring plans. While not requisite, a general knowledge of steam and water-power plants was desirable, and would have due weight with the examiners.

The man who possessed these qualifications could fill the position of superintendent of electric lighting or street railway plants.

Second-class licenses were issued only to persons fully competent to install and operate incandescent light, arc light, or power plants, and were obliged to have a general knowledge of the construction and operations of dynamos, electric machines and other electrical appliances pertaining to the particular classes of apparatus it is desired to operate; a thorough knowledge of the insurance rules pertaining to such apparatus; a thorough knowledge of the calculations necessary for and the rules governing electric wiring. While not requisite, a general knowledge of steam and water-power plants was desirable, and would have due weight with the examiners.

Third-class licenses were issued only to persons fully competent to make electric light and power installations, and who were not competent to operate electric machinery. They were obliged to have a thorough knowledge of the calculations necessary for and the rules governing electric wiring, and the ability to make complete wiring plans; a thorough knowledge of the connecting of electric light and power machinery to the wiring, and a thorough knowledge of the insurance rules governing wiring for electric light or power. The holders of these licenses were classed as wiremen.

Fourth-class licenses were issued only to persons competent to install and operate but one of the following plants, viz.: incandescent light, arc light or power. They were obliged to have a specific and thorough knowledge of the installation and operation of the class of apparatus it was desired to install and operate, together with the knowledge and ability necessary to do the wiring pertaining thereto, and a thorough knowledge of the insurance rules governing the class of apparatus to be installed and operated.

Fifth-class licenses were issued to persons competent only to operate electric machinery, and who were not competent to do electric wiring. The applicant had to possess a general knowledge of the operation of the particular electric light or electric power machinery it was desired to operate, and a thorough knowledge of the insurance rules pertaining to such machinery. In all such cases storage or secondary batteries were included under the head of electrical machinery.

All licenses were valid for one year from their date, but the licensee could apply within that time for examination for a license of a higher class, or could renew the original upon its expiration.

The examiners were men of known ability and practical experience, and the examinations, while necessarily technical in some classes, were as practical as possible in all cases.

Many young men, many of whom had received a technical education, who were confident of carrying off the highest prize—a first class license—found themselves placed much below that much coveted goal; while very many others, who modestly sought one of the lower grades, were placed one or two grades higher. These latter, as a rule, had limited educational advantages, and did not occupy a commanding social position, but had acquired habits of industry and perseverance, and many of them are occupying responsible positions to-day.

I contend that the good work done by this organization should be continued by either state or municipal authorities, because it would benefit all and injure none. Competent men need have no fears of such a system, and surely incompetents should not be entrusted with a class of work on which so much depends.

It is true that this system extended only to those engaged in the electric light and power branches of the electrical business, but it should also apply to those engaged in the care and construction of fire and police systems.

It has been the practice in the past

* A paper read before the National Association of Municipal Electricians, Wilmington, Del., September 6, 1899.

(I hope it is not so at present) for the agents of rival signal systems to attempt to impress on the minds of the city and town authorities "that their particular system needed little or no attention once it was installed; that a little sulphate of copper dropped into the bottom of the cells of the battery, and a little water poured in to cover the zincs, would allow it to take care of itself, and when open-circuit batteries were used no attention need be given them." This kind of deliberate misrepresentation resulted in the appointment of some one to the nominal position of superintendent of one or both of these signal systems, at what must be a nominal salary in many cases, while the honor of bearing the title was considered ample remuneration in others. Those who secured such positions, and those who appointed them, soon realized that intelligent supervision was necessary and cheapest in the end, after paying a high rate per diem, together with traveling expenses, to the manufacturers' employés, to find an open circuit, locate a ground, adjust a gong, bell striker, whistle-blower or box, or bring a practically dead battery to life; while the tax-payers might thank their stars if property in excess of the entire cost of the signal system, and the amount of the salary of a competent superintendent during his natural life, was not destroyed, because the fire department could not be summoned by a system supposed to take care of itself, except that given it in the manner above described.

Some of my own personal experience with persons entrusted with the care of electric light and power plants was and is enough to make one shudder at the possible consequences due to either the misplaced confidence or parsimony of their employers; while many of those engaged in electrical construction possessed as little knowledge of the laws of the current, or the established rules governing the work they were engaged in, as a digger Indian did of the solar system.

The youth who succeeds in connecting up a few cells of a battery, a push-button and call-bell, and who, in the opinion of his fond parents and neighbors, "knows all about electricity," can not be called a good wireman. The man who installs speaking tubes, annunciators, call-bells, and gas-lighting systems can not make wiring plans, estimate the size of conductors and place the same in position for electric light, heat or power purposes until he has a proper training in that kind of construction.

The man who believes the dynamo electric machine generates electricity in the same manner as does the frictional machine of his school-boy days, and that the large number of dynamos now in operation will soon "so change the earth that it will burn up or explode," who makes additions to existing wiring with annunciator wire, because it is easy to handle, or iron wire because it is cheaper than copper, and who uses copper or iron wire, printers' lead, iron nails, or anything handy, because they are more durable than fusible metal, is evidently out of place when in charge of an isolated plant.

Last of all, the men who have "pulls" are active political workers, who give freely of their time for the benefit of their party, I concede have a perfect right to do so, but this fact should not entitle them to a position as superintendent of fire and police telegraphs, or municipal lighting plants, unless they possess the necessary qualifications for the positions.

Finally, I believe it to be the duty of all who are engaged in any branch of the electrical business, particularly the members of this association, to do everything possible to establish in every state in the Union a system of license for electrical workers similar to that which I have described, which was a perfect success from the start, receiving the active support and approval of the best men in the electrical business.

Can any one here for a moment defend the systematic attempts of contractors, manufacturers and others to introduce the cheap, flimsy devices with which the markets are flooded, or the compounds that are used as a substitute for the insulating covering of wires? I think not; but a wider or more fruitful field for the makers and venders of the worst shams that ever were imposed on a confiding public does not exist than the electrical. No matter how earnestly or faithfully men like myself may labor for the suppression of material and devices that are no better than shams, that bring into disrepute the use of electricity, and endanger the lives of the community, and make possible sweeping conflagrations, they will still find a market for their wares in territory beyond the jurisdiction of the faithful, honest, fearless and conscientious municipal inspector.

Boston may condemn these shams and drive them beyond its borders, and at the same time administer a scathing rebuke to those who would, in a sense, become the executioners of their fellow men and destroyers of their worldly goods; but they only laugh and say there are other markets in which there are no restrictions on this damnable traffic, and the average customer, left to himself, knowing nothing of the safeguards necessary to be thrown around this subtle power, drives the closest bargain he can, and buys that which costs least at first but may prove fearfully expensive in the future. This state of affairs will exist so long as the great majority of the people will persist in remaining in total ignorance of this, to them, mysterious power, or until municipal authorities protect their citizens from this class of worse than impostors through the medium of able, honest and fearless supervisors, who stand above reproach, whose word is as good as a bond, whose decisions can not be questioned, and, best of all, who bring down on their devoted heads the wrath of the class here described.

The doors of the jail should be opened wide and closed for long terms on those who would make, sell or use any device or material, to be placed in an electric circuit knowing it to be unsuitable or unsafe.

I charge those of you that are entrusted with the supervision of electrical construction, to make relentless war on material and devices whose only recommendation is cheapness, and keep close watch on those who would make, sell or use them. To those in charge of fire and police telegraphs, I would say bear this motto in mind at all times, "The best is none too good for the systems in your charge."

Electric Plants in Germany.

United States Consul Monaghan writes from Chemnitz, as follows:

"A most interesting feature of this Empire's development is found in the number of electric plants in course of construction and projected. French writers, notably Emile Gautier, Charles Bos and J. Lafargue, are trying just now to arouse French emulation. It seems to me that American manufacturers might obtain contracts to furnish some of the materials needed in the plants. A large company has been organized here to build an electric railroad from this city (Chemnitz) to Burgstaedt, 12 or 15 miles away. As projected, the road is to run through many large and important villages. If continued to Mitweida, as some think it will be, should no rival concern open an opposition line, the distance covered will amount to 30 or more miles. There is also a project to build a central electric plant for supplying the road with power, and the villages through which the road is to pass with electricity for light. Chemnitz has a population of nearly 200,000 souls; the towns included in the plans referred to contain about 75,000. The company expects to expend $357,000 on the road, and a similar amount on the buildings. Besides this, a cable road is being surveyed to Augustusberg, a well known resort a few miles outside the city. While the disposition to patronize home industries is very strong here, I can not help thinking that we must have certain things which, once seen, would win their way to favor.

"An interesting question is: How can an American house hope to obtain concessions or contracts? The best way, it seems to me, would be to send one or two experts, familiar with electric plants and their needs, to study the situation. What is true of Chemnitz is true of almost every city in the Empire. In the month of June there were 330 railroads projected in the Empire. Of these, 73 were electric roads; 122 electric plants were projected during the same time. It would be easy for an expert to keep himself posted, by visiting or communicating with the United States consuls general in Berlin, Frankfort and Dresden. Patriotism has seldom been pushed so far as to force private companies to take inferior or dearer home products.

"The market here just now is so large—consequently so important—that an effort should be made to sell in it, even at the risk of not making a great deal of money at the outset. The methods that have helped at home must help here. A report made by an expert who has gone carefully over the ground would supply specific details in a way not possible to consuls."

A Big Electric Power Plant for San Francisco.

One hundred and fifty thousand horse-power of energy is to be supplied to the city of San Francisco from Blue Lakes, 150 miles away. The total output of the plant has been contracted for in advance by San Francisco parties, customers of the Standard Electric Company, of that city. The system adopted is the Stanley, of Pittsfield, Mass., and the work of installing will proceed as rapidly as possible, the contract for the apparatus having been entered into a few days ago.

For Young Men.

A very large number of young men are handicapped in business and social life by deficient education. For these there are excellent opportunities presented in the evening classes of the Young Men's Christian Association. Here they may get an education at the same time they are earning a living.

At the West Side Branch, 318 West Fifty-seventh street, New York, there are elementary and advanced commercial courses, and language and scientific subjects so arranged that a young man can take one or more studies at a time and devote to study as many or as few evenings as he desires.

The opening exercises of these classes will be held at 8 P. M., Monday, October 2, when Mr. J. Armour Galloway will sing, and Dr. M. Woolsey Stryker, president of Hamilton College, will make the address of the evening.

In addition to the classes, there are Reading and Current Topic clubs, Literary Society, a library of over 42,000 volumes and many other attractions, for which a fee of $5 per year is charged. A 40 page illustrated prospectus will be sent free to any one addressing the secretary at 318 West Fifty-seventh street.

The Automobile.

[*From the Chicago Times-Herald.*]

It doesn't shy at papers
As they blow along the street;
It cuts no silly capers
On the dashboard with its feet;
It doesn't paw the sod up all around the hitching post,
It doesn't scare at shadows as a man would at a ghost;
It d esn't gnaw the manger,
It doesn't waste the hay,
Nor put you into danger
When the brass bands play.

It makes no wild endeavor
To switch away the flies;
It sheds no hair that ever
Gets in your mouth and eyes;
It speeds along the highways and never looks around
For things that it may scare at and spill you on the ground!
It doesn't mind the circus,
It's not at all afraid;
And it doesn't overwork us
When the elephants parade.

It doesn't rear and quiver
When the train goes rushing by;
It doesn't stand and shiver
When the little snowflakes fly;
It doesn't mind the thunder nor the lightning's blinding flash;
It doesn't keep you chirping and connecting with the lash;
It never minds the banners
They display on holidays,
It's a thing of proper manners,
Which it shows in many ways.

When you chance to pass its stable
You do not have to care
Or cluck for all your able
To keep from stopping there!
It will work all through the daytime and still be fresh at night;
There is no one to arrest you if you do not treat it right!
Its wheezings ne'er distress you
As it moves along the way—
Farewell old Dobbins; bless you!
You were all right in your day.

Electric Tramways in Nice.

The following, dated Nice, August 11, 1899, has been received from Vice-Consul Piatti:

In the course of an interview which I had yesterday with the Mayor of Nice, I learned that the new electric tramways which were to be operated about October 15 will, until December 15, be run by horse-power. The reason given is that the existing telephonic wires are not of proper design to resist being affected by the power used for the tramways, so that they must be replaced by better cables laid underground; but not a single concern, it is said, can be found in France to deliver the necessary cables before November 1.

This, in itself, may not be a fact of paramount importance; but, reverting to the continuous attempts made by this consulate to induce our manufacturers to cultivate the very considerable opportunities offered by the port of Nice for a direct trade with the United States, it may not be out of place to say that in this instance, an American firm might have competed with success in furnishing the necessary electric cables.

Foreign Enterprise.

We learn that the whole of the electrical concessions in the town of Valladolid, in Spain, have been secured by a Belgian syndicate, who have obtained sole control over the tramways, which they will extend and transform into electric lines. It will be seen that in the list of exports of electric machinery from Switzerland (given elsewhere in this issue), Spain stands high in the list of countries purchasing Swiss electric machinery. We have also given from time to time notices of tramway and electric light concessions which have been advertised in the Spanish press. The reason given why so few of these concessions are secured by English companies is that the business morality of the Spanish municipal authorities is, as a rule, exceedingly difficult to locate. We see no reason why, however, the Swiss and Belgian firms should be more capable of keeping the Spaniards to their promises than Englishmen. We trust, therefore, that in the future we shall see more electric works in Spain being equipped from this side, as was the case in Madrid and a few other towns. We recently heard an amusing incident from an English engineer who had charge of the erection of some electric works in an outlying district in Spain. He found that the workmen obtainable considered that to work two days per week was all that could be expected of them. His solution of the difficulty consisted in locking the engine-room doors, and feeding his staff through the windows, until such time as the work in hand was completed—*The Electrical Engineer, London.*

FIG. 1.—A SUBWAY TRANSFORMER.

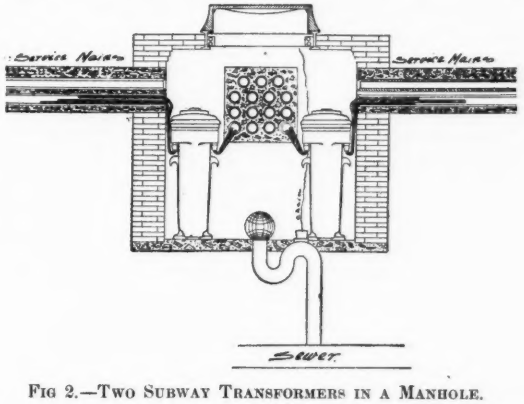


FIG 2.—TWO SUBWAY TRANSFORMERS IN A MANHOLE.

DENTON, TEX.—The telephone system of this city has changed hands, O. T. Graham transferring the property to R. B. Walker, of Jefferson, Tex., who has taken up the active management.

Subway Transformers.

Peculiar conditions to be met govern the characteristics of all mechanical or electrical apparatus. There has been a tendency of recent years, in large cities, to remove all electrical conductors from poles, and place them underground. Because of this change of wiring practice, it became necessary to employ transformers not only weatherproof but waterproof.

The General Electric Company was among the first to attack the problem of manufacturing a transformer that would not be damaged, even though completely submerged in water, as sometimes occurs in a manhole. A complete line of "watertight" or "subway" transformers, of sizes five kilowatts to 30 kilowatts, inclusive, was developed, and have the high efficiency and superior qualities of the well known type "H" transformer. As an indication of the favor with which this particular production of the General Electric Company is viewed, it may be noted that a large lighting company, having decided to replace 24,000 lights capacity of pole transformers, contracted with the General Electric Company to supply the necessary capacity of subway transformers of sizes from 10 to 30 kilowatts.

The transformers are of the standard type "H" construction, with the exception of the case. The case is oval, in horizontal sections, with lifting lugs on the sides, so arranged that they will not interfere with the sides of the manholes when being placed in position.

The arrangement for carrying the cables into the case is very interesting. The lead-covered cable is passed through a metal bushing, and a plumber's wiped joint made, after which the bushing is drawn tight against a faced seat by a nut on the inside of the transformer, a special wrench being furnished for this operation. The cover is held in place by a number of bolts, the surfaces of the box and cover are machined, and a specially prepared elastic packing to exclude all moisture is used.

One of the accompanying illustrations shows a diagram of two 30-kilowatt transformers as located in a manhole; the other a 10-kilowatt transformer with cover removed. The number of bolts for clamping down the cover indicates that the point of an absolutely watertight joint has been most carefully considered. In the cover is shown a short pipe. To this is attached a pipe long enough to reach above the high-water mark of the manhole. This serves for a vent to allow expansion of the oil from heat and also to prevent explosion in case of the formation of dangerous gases inside the transformer.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

LAFAYETTE, TENN.—A telephone line is being put up between this place and Willette.

FRANKFORT, KY.—The Flemingsburg Telephone Company, of Fleming County, has been incorporated. The capital stock of the company is fixed at $2,500. The incorporators are Charles S. and J. H. Powell and J. M. Baldwin, all of Richmond.

DEERFIELD, WIS.—A farmers' telephone company has been organized in the town of Christiania by John C. Lillesand, president; Thomas Rockney, secretary; L. Egre, treasurer, and K. Henderson, general manager. The line will run from Cambridge to Utica via the Prairie Queen creamery, and from Utica back to Deerfield.

ST. LOUIS, MO.—Arrangements are being made for a new long-distance telephone to cover all important points in the Mississippi Valley. The new company will be an outgrowth of the Kinloch Telephone Company, of St. Louis, which has recently extended its local service at an expense of $212,000. It will be incorporated October 1, with a capital stock of $1,000,000, and will be known as the Kinloch Long-Distance Telephone Company.

TACOMA, WASH. — Arrangements have been made by Superintendent Sands, of the Sunset Telephone Company, to extend the telephone line to Fern Hill and Larchmont.

PENN YAN, N. Y.—A new telephone Company has been organized under the name of the Syracuse, Rochester & Lake Ontario Telephone Company. It is a consolidation of the Wayne County anti-Bell companies and its main office will be at Lyons.

CLEVELAND, OHIO—The American District Telephone Company has been incorporated, with $100,000 capital stock. The company is to operate a general messenger delivery and district telegraph service. The incorporators are Herbert D. Bennett, Gansey R. Johnson, Harry M. Daughtery, W. W. Walker and William F. Burdell. In addition to the district telegraph service the company is to do a general collection, storage and delivery of packages, freight and other property.

WESTERVILLE, OHIO—The Village Council has passed an ordinance granting a franchise to the Franklin Telephone Company. According to the provisions of the franchise the company must have an exchange in operation in the village within six months. A limit of ten cents is fixed for a toll rate to any point in the county which is reached by the Franklin company's lines.

PASS CHRISTIAN, MISS. — The American Telephone and Telegraph Company, of Mississippi, has been incorporated, with a capital stock of $25,000, by Edward J. Hall, Edward P. Meany, N. Eggleston and others.

PLAINFIELD, N. J.—The New York & New Jersey Telephone Company is planning to still further extend its lines. The present line to Neshanic, from Somerville, now runs within a few hundred yards of the village of South Branch. It is the intention of the company to run a line into South Branch and establish a pay station there.

WAPAKONETA, OHIO—The United States Telephone Company has secured the right of way through this county for the erection of a long-distance telephone line in opposition to the Bell telephone system. They are now working Ohio and Indiana and will put up the poles in this county in a few weeks.

MIFFLINTOWN, PA.—The Tuscarora Telephone Co., has been incorporated, with a capital of $40,000. The company will erect lines through Adams, Bedford, Blair, Centre, Clinton, Cumberland, Dauphin, Franklin, Fulton, Juniata Lycoming, Mifflin, Northumberland, Perry, Schuylkill, Snyder, Union and York counties. The directors are A. G. Schall, Carl F. Espenschade, Mifflintown; I. N. Grubb, Thomsontown, N. J.; J. C. Moorehead, Port Royal; E. A. Garman, Richfield.

PARIS, TEX.—The work of planting the poles for a telephone line between Paris and Arthur City has been completed, and nearly every village in the county will soon be in telephone communication with the county seat. The lines are being built by private individuals.

CENTERVILLE, IND.—The Centerville Telephone Company has been incorporated, with a capital stock of $10,000. The directors are T. J. Clevenger, F. M. Clevenger, John E. Burris, Walter McConaha, Thomas G. Dunbar and J. E. King.

BONHAM, TEX.—The telephone line between this city and Lawasco, a rural village about 15 miles northeast of here, has been completed.

New Electric Railways.

PHILADELPHIA, PA.—The Inland Trolley Company has been incorporated at Lansdale, Pa., and will construct a trolley road from Lansdale to Chestnut Hill. A power-house and car barn will also be erected and equipped with the usual appurtenances. Power machinery, engines, boilers, dynamos, etc., are included.

NEW ALBANY, IND.—The New Albany Street Railway Company, with a capital of $50,000, has filed articles of incorporation.

BROOKLINE, MASS.—There is a plan on foot for the construction of an electric railroad from this place to Worcester. The proposed road is to start from the terminus of the West End road in the town of Brookline. Plans made show a very straight line for the laying out of this route, and it is expected towns along the line will soon be asked to grant franchises for a location. It is reported that the stock is all subscribed for.

PETOSKEY, MICH.—A street railway to Bay View is now certain next season.

DOVER, DEL.—The new Delaware General Electric Company, which has secured the right of way to the Kent County public roads, and has filed a charter with the Secretary of State with a paid-in capital of $1,000,000, has completed its organization. The incorporators are Solomon R. Friedenburg, Leo Belmont, William Graham, Attorney-General White, Morris Bernheimer and Recorder James Lord. The company has effected a temporary organization with Leo Belmont as president, William Graham as secretary and Morris Bernheimer as treasurer. Colonel Leland and Engineer Harris, of Philadelphia, have begun the survey.

DENVER, COLO. — The Cripple Creek Railway Company has been incorporated; capital, $1,000,000; incorporators, G. D. James, W. E. Stiffel, T. F. Brett, H. W. Twombly, W. R. Brown, A. A. Crocker, G. H. Proctor, all of Denver.

TOLEDO, OHIO—H. A. Haigh and S. S. Angus, capitalists of Detroit, have completed arrangements which will give a new electric road from Toledo to Buffalo, which will be the longest road of its kind in the world. The material is now on the ground for the construction of the line from Toledo to Norwalk, and this will be running by December 1.

GOSHEN, IND.—The Goshen & Indiana Traction Company to run an electric line from this place to Angola. The capital is $200,000. The directors are John F. Shuman, Sol A. Wood, W. W. Hatch, M. E. Griswold and F. S. Roby.

Electric Light and Power.

SAGINAW, MICH.—The Bartlett Illuminating Company has purchased the steam plant and building, where the electric light plant is located, of A. F. Bartlett and Company, and will in a few days buy the West Side Electric Light Company's plant. Its capital stock of $50,000 will be largely increased.

NATCHITOCHES, LA.—The city will hold an election to decide the issuance of bonds for construction of waterworks and electric lights to cost $9,000. Address, John C. Trichel.

TRENTON, N. J.—The Southern Light and Traction Company, with an authorized capital of $2,500,000, has been incorporated. The articles of incorporation confer the power to purchase the bonds, mortgages and other debts, as well as the capital stock of other companies. The incorporators are Charles N. King, N. R. Vanderhoff and Augustus C. Kellogg, all of Jersey City.

KENOSHA, WIS — The Kenosha Light and Power Company proposes to improve its plant at a cost of $30,000. Address President Schott.

MANAWA, WIS.—We are informed that the Little Wolf River and Lumber Company will purchase and install a plant of 75 or 100 lights capacity.

DURANT, MISS.—This place has voted to issue bonds for a plant. J. C. Hill, Mayor.

NEW CUMBERLAND, OHIO—The Mayor has appointed a committee to investigate the advisability of the city owning its electric plant and waterworks.

BRONSON, MICH.—This place is reported to have voted to issue $8,000 in bonds for a plant.

PONTIAC, MICH.—Bids are asked until September 11 for electric lighting. C. D. Jones, electric engineer; H. Coleman, chairman committee.

ABBEVILLE, S. C.—A charter has been granted to the Electric Light and Power Company, of this place; capital stock, $15,000.

WILLIAMSPORT, PA.—The contract for lighting the streets of this city with electricity has been awarded to Thomas Lynch, of Philadelphia.

ELLSWORTH, ME.—The consolidation of the Ellsworth Electric Light and the Ellsworth Water Companies has been effected. The new company is known as the Ellsworth Electric Light and Water Company.

KANSAS CITY, KAS.—The Standard Electric Light Company has been incorporated; capital, $25,000.

New Incorporations.

JERSEY CITY, N. J.—The A. A. McCreary Company has been incorporated to manufacture electric lighting apparatus; capital, $25,000; incorporators, A. A. McCreary, Philip Hathaway, Clifford W. Perkins.

NEW YORK, N. Y.—The International Telephone and Switchboard Company, with an authorized capital of $1,000,000, has been incorporated. The company is to make telephones and switchboards. The incorporators are L. B. Grant and Thomas S. White, New York, and J. C. Pope, Plainfield, N. J.

ST. LOUIS, MO.—The Van Etten-Lyons Electric Company, to manufacture electrical apparatus and machinery, has been incorporated; capital, $5,000. Incorporators, S. Van Etten, H. E. Lyons, A. Carter, A. B. Donnelly, all of St. Louis.

NEWARK, N. J.—The Monroe Light and Power Company, office, No. 765 Broad street, has been incorporated to manufacture electricity or gas for light, heat and power; capital, $10,000. Incorporators, John S. Day, George S. Day, Newark, N. J.; Rosie Jacobs, Ignatius Weltner, New York city.

DOVER, DEL.—The Boston Industrial Company, a concern licensed to construct, own and operate plants for the manufacture of water gas, electrical works and electrical railways (outside the state of Delaware), has been incorporated with a capital stock of $100,000.

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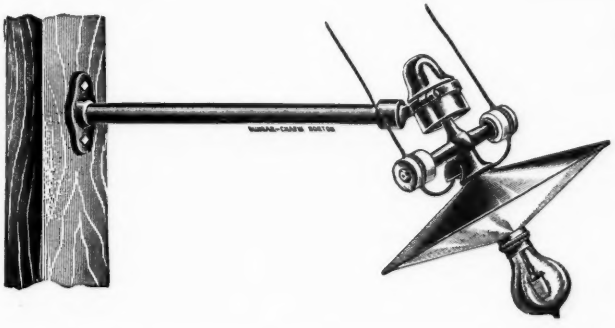

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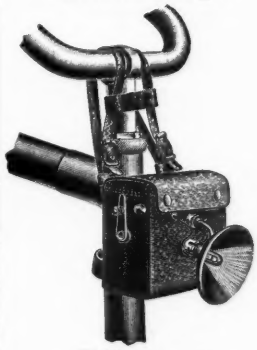

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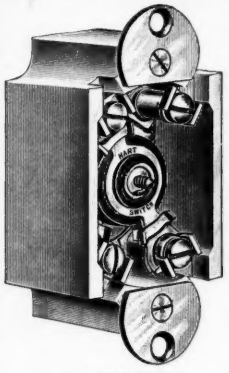

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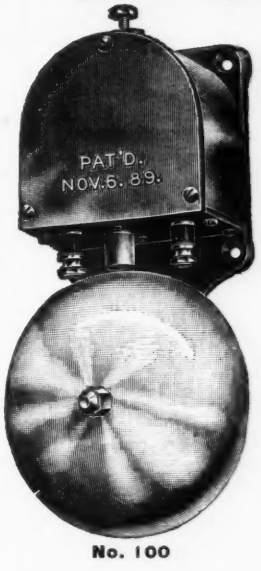

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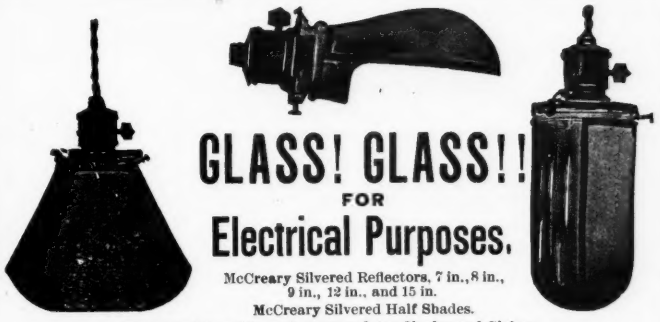

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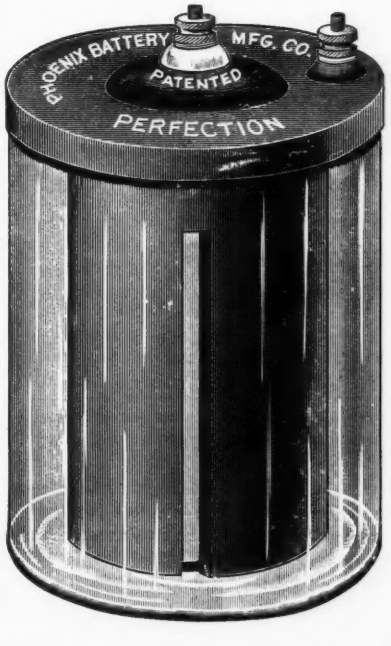

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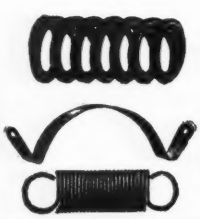
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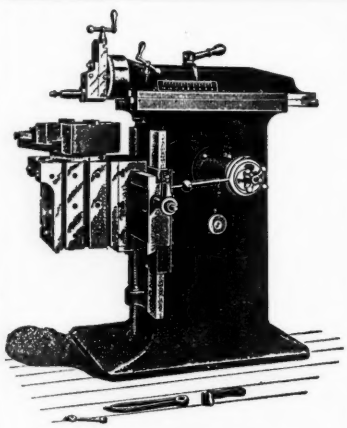
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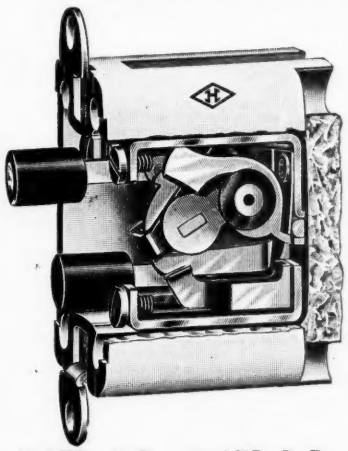

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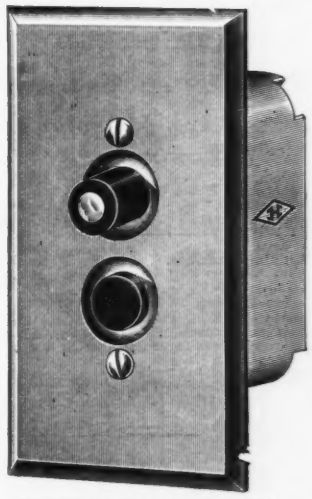

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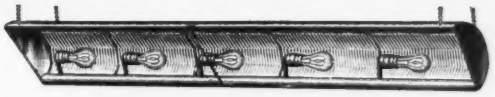

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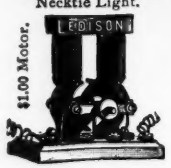

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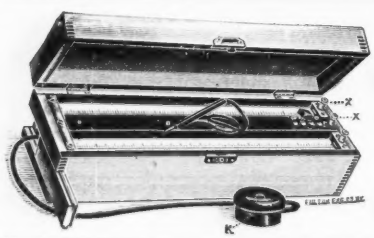

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